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The Outlook

The Ides of March

THE fifteenth day of this month was what the Romans called the Ides of March, well known to all readers of Shakespeare's *Julius Cæsar*. Some would-be prophets told us that on that day the Germans would start mass attacks by air on Great Britain; and if not on the Ides, then on some other day of the month. Well, the Ides of March have come, as Cæsar said, and (which he was in no position to say) they have gone; but March has not gone, and we decline to prophesy what will happen in the air during the rest of the month. We are inclined to quote another tag of history—"Trust in heaven, and keep your powder dry," alleged to have been Cromwell's instructions to his troops. We should modernise that into "Do not worry, but have your respirator handy and keep your bath filled with water."

Judging by probabilities, a mass air attack just now is not to be expected. If the Germans had thought such tactics worth while, they would surely have indulged in them last autumn, when they had a clear numerical advantage in aircraft, even after losing a certain number in Poland. That numerical advantage has now gone, and there is therefore the less reason for making an air attack on this country. If there was no sufficient reason for making it in the autumn, there is not more but less reason for making it now.

Some have suggested that there was a reason for delaying, namely, while the numbers of the Junkers 88 were being piled up, as no other German bomber was thought good enough for an attack on Britain. That type depends on speed and evasion, not on gun power, and all the evidence at present goes to show that bombers must be able to hold their own in a fight. Another possibility is that the Germans, realising rather late in the day the great advantage of the power-operated gun turret, will delay their air offensive until they have amassed a bomber force equipped with those turrets. That would take a considerable time, and British science is not standing still. Doubtless our authorities are considering the question of whether, if German bombers had even an inferior turret while we had an improved one, the actual advantage which we now possess would not be diminished. If that were to be the conclusion, it would be an argument for us to force on a major clash in the air—though how that could be done without abandoning our principles is not easy to say. If the Germans are thinking on those lines, their obvious policy would be to delay the clash.

On the whole, however, we stick to our belief that attacks on cities are only to be expected in one of two cases, either when the attacker is so strong that he fears no reprisals, or when he is desperate and reckless of the result. The first case certainly does not apply to the Germans now; while as yet they can hardly believe themselves to have reached the latter pass. But German mentality may upset all reasonings, and therefore we repeat the warning "Keep your powder dry."

The attack on Scapa Flow last week-end may give an indication of the policy which Germany intends to adopt during the near future.

A Serious Disclosure

REPRESENTATIVES of the independent airline operators saw the Air Minister, the Under-Secretary of State for Air, and the Director-General of Civil Aviation last Friday, and now we do know where we stand in the matter of internal civil aviation. Sir Kingsley Wood explained that, although he was very sympathetic, he had to take the broad view, and after careful examination he could hold out no hope of a reconsideration of the Air Ministry's decision.

The Air Minister, during the interview, gave a new reason for the taking over by the Ministry of nearly

all civil aircraft; particularly in view "of the responsibility of the Air Ministry to the Army for providing aircraft for Army co-operation it was imperative that much of the work which had so far been carried out by the civil companies should in future be performed by the Air Force itself." Either this explanation means nothing at all or it means a very great deal. It is scarcely likely that the civil aeroplanes will be used for Army co-operation work, so that one can only assume that the explanation must be that machines now used somewhere by the R.A.F. for work which *could* be done by civil types are to be handed over to the Army, and the R.A.F. is to use instead such civil aeroplanes as the Air Ministry may decide to take over for the purpose.

We have often expressed in this journal the view that in case of war the Army would need a large accession to its flying equipment, and that this might be difficult to provide at short notice. It would appear that such has now been proved to be the case, otherwise it is not easy to account for Sir Kingsley Wood's statement.

Time-saving Routes

WHEN he came to explain how it was that the choice of companies to be allowed to operate included such a large percentage of firms in the railway group, Sir Kingsley Wood said that he had to consider national interests, and these he interpreted as meaning the retention of routes on which there is a considerable saving of time, such as those which cross large stretches of water. Either it is very fortunate for the firms in the railway group that they chose such routes originally, or they have shown a foresight with which few would have credited them. Even this group of companies, Sir Kingsley Wood said, would have to part with something like one-half of their aeroplanes, and it was obvious that this would leave them so short of flying stock that they would not be able, nor indeed permitted, to operate any of the routes which independent operators were being compelled to abandon.

So we have the position that the number of civil aircraft to be ordered—if there is any intention to order any at all—is so minute that they could only represent some fraction of one per cent. of our output. If we are so desperately pressed as all that, and certainly the Germans will not fail to make capital out of the situation, then there is nothing more to be said on the subject. But it is difficult to believe that this is so.

Elsewhere in this issue we publish the first instalment of an article by a contributor on the civil aviation situation. His findings are somewhat illuminating.

The Camera Cannot Lie

RECENTLY it has been officially disclosed that a system has been introduced into the Royal Air Force which is not likely to appeal to our enemies—from any point of view. British fighter aircraft are equipped with film cameras synchronised with the machine-guns. While the gun triggers are kept depressed the camera "shoots."

Obviously, the primary object of the system is to improve the aim of our fighter pilots, already fairly good, as results have shown. The path of the bullets can be seen on the film, and thus a fighter pilot can profit by his mistakes and correct any faults which he has developed.

To us it appears that the idea is very excellent in every way. The marksmanship of our pilots can hardly fail to benefit greatly, but there is another side to the question which the German propaganda department will dislike intensely. In future it will not be possible for the German wireless to announce that "In spite of heavy opposition all our aircraft returned safely" if there is in existence a film record which shows how and to what extent our fighters' fire took effect.

LOOKS EASY, DOESN'T IT? A radio-controlled Airspeed Wasp taking off "somewhere in England."

WAR in the AIR

A Pilot's Account of a Flight to Bohemia : Scapa Flow Bombed

Field Marshal Goering with some of his staff and officers of a squadron on the North Sea coast. It will be noted that the officers carry side arms in the form of small Mauser automatic pistols.

THE sudden signing of peace between Russia and Finland has been the chief subject of interest in the past week, and has distracted attention from the great war now in progress. Sympathy for the Finns is world-wide, and our own chief regret is that, for certain reasons, it was not possible for France and Britain to send them the help which they (the Allies) were ready and anxious to send. However, we remember with satisfaction that between us we and the French actually sent over 400 aircraft, including 67 bombers, and that British machines did good work in taking toll of the merciless Russian bombers. The history of Finland is not yet over and done with, but what the next chapter will be cannot yet be foretold.

Turkish Discussions

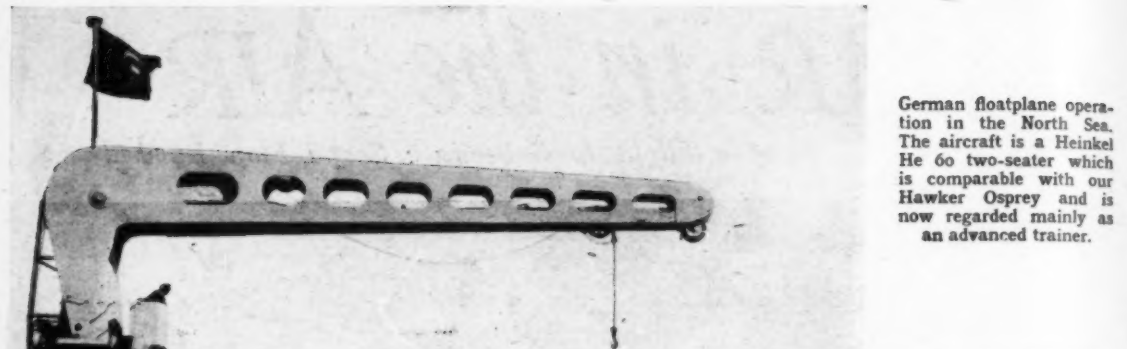
FROM Scandinavia one turns to the Balkans and Near East, and recently Air Chief Marshal Sir William Mitchell, A.O.C.-in-C. the Middle East, and Gen. Jeanneaud, who commands the French air forces in Syria, paid an official visit to Ankara at the invitation of the Turkish General Staff. The Allied officers were greeted by Lieut. Gen. Kilkis, who is in command of the Turkish air defence, and who was attended by the whole of his staff. Cordial discussions on air matters took place between the Turkish, French, and British commanders. The outcome of these conversations may yet be very important.

Air interest has not been great on the Western Front of late. That is to say, there has been unremitting activity but few outstanding incidents. A German aircraft made persistent attempts to sink another lightship off the Norfolk coast on March 6 and 7, but this time without success. In the second attack 16 or 18 bombs were dropped, but little damage was done and not one of the crew was hurt. There have also been more attacks on Dutch merchant ships.

More lively interest is aroused by a report of another attack on a U-boat by an aircraft of the Bomber Command. It was on a reconnaissance flight over the Heligoland Bight on the afternoon of Monday, March 11, when it arrived over the mouth of the Schillig Roads, not far from where another U-boat was bombed and sunk a week before, when the crew saw a submarine proceeding slowly on the surface. The aircraft had just emerged from a layer of low cloud, and it immediately crossed the submarine, dropping four 250-lb. bombs, one of which was seen to hit the submarine just ahead of the conning tower. Another hit is also believed to have been registered. The pilot reports that before he flew off to continue his reconnaissance he saw

Courtesy British Movietonews

An R.A.F. armourer extracts the cartridges from the magazine of a German machine gun.



German floatplane operation in the North Sea. The aircraft is a Heinkel He 60 two-seater which is comparable with our Hawker Osprey and is now regarded mainly as an advanced trainer.

the bow and stern of the submarine protruding above the surface, the centre part being submerged. Another of our aircraft engaged on reconnaissance a few hours later saw a number of patrol vessels in the area where the attack had been made.

One of the pilots who was engaged on a recent reconnaissance flight over Bohemia has given the following account of his experience. "Our particular objectives that night," he said, "were Prague and Pilsen. So we set our course to the east. The weather happened to be excellent. A good moon, with visibility in the region of thirty miles. That is not always the case. Many other crews have had to fly in much worse weather. This time we were lucky. We climbed to our operational height, then throttled back our engines to cruising speed, and got our aircraft trimmed. On this occasion we were carrying a crew of six, comprising pilots, navigators, gunners and wireless operators. Our particular trip was going to take us eight to nine hours. We also had to allow roughly another hour for looking around and unloading our pamphlets.

"With the aircraft trimmed there was nothing very much to do for the moment. The navigator was checking up on his landmarks as they came into view, and from time to time, as the sky was clear, he would take a sight with his sextant. There was plenty of light from the moon, and features on the ground were easily discernible. As we reached the German frontier it was difficult not to believe that the eyes of every German on the ground must be looking up at us. But nothing happened just then. No searchlights were trained on us, no guns were fired and no enemy fighters came up to try to intercept us. Sometimes on these flights it is intensely cold and one needs all the kit one can possibly put on. This night, however, was comparatively warm, and no one needed his heavy flying clothing.

"From the frontier our course lay over the Rhine. Soon Frankfort passed beneath us. Then Nuremburg was slipping past beneath our wings. We remembered the famous racing track there and wondered when it would again be used for an international event. Now Germany lay beneath us under a cover of snow, and though this added to the lightness of the night, it also made features on the

Refuelling a Messerschmitt Me 109 single-seater fighter. It will be noted that the tank is behind the cockpit.

The defences of Eerlin include a number of look-out posts such as that shown on the right.

ground harder to distinguish. After a time, we noticed that the rigid black-out which had been maintained in Germany was diminishing, and we knew that we had now crossed another frontier, into Czecho-Slovakia. Our next excitement was when the navigator warned us that we were approaching Pilsen, home of the great Skoda armament works, and of the, perhaps even more famous, lager beer. We slowly lost height as we approached, and then, levelling out, we new across the town and dropped a couple of parachute flares to announce our arrival to the residents and visitors. There was no reply, and the navigator set us on a new course, heading north-east for Prague.

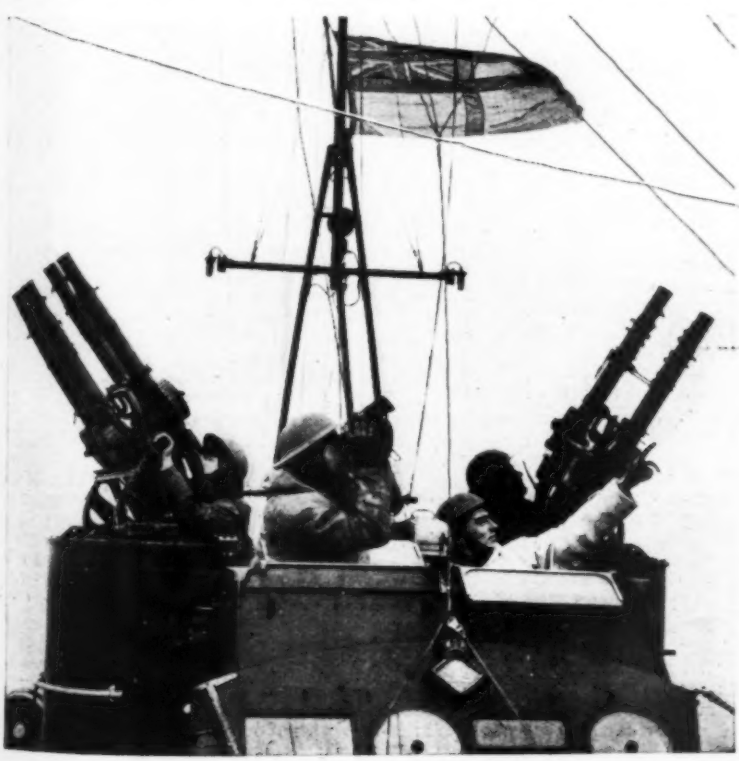
"There was no mistaking Prague. The whole town was a blaze of light, houses, street lamps and factories were all lit up. Even the ornamental lighting on the bridge was aglow. Again we flew low over the city, while two of the crew began scattering the many thousands of leaflets which we were carrying. Without interruption we completed our job, and when the last leaflet had vanished astern, we swung round and began the long and monotonous flight back to our base. By now everyone was feeling a bit sleepy. Some of them were having a hot drink. Others were eating chocolate or chewing gum. The time passed slowly, but at last we recrossed the Czecho-Slovakian border and were back again over Germany, where the black-out was as effective as before. Once we passed over an area where several searchlights leapt into action at our approach. But we were flying too high for them to be effective. The weather was still good enough, but the sky had now become overcast and there was a slight drizzle of rain. We crossed the Rhine Valley and noticed that while the valley was still covered with snow, the river appeared to be unfrozen.

"As we neared home we kept a sharp look-out for another aircraft which had left about the same time as ourselves on a similar mission, and which we knew was now a few miles ahead of us. We did not see anything of him. Our base aerodrome was now getting very close, and the crew had already started to stow away their gear. There was going to be no time wasted once we had landed. A few minutes later the lights of our aerodrome came into view, and almost immediately we got the signal giving us permission to land I can assure you it was promptly accepted, and we taxied in to find good friends on the ground with plenty of hot tea ready, waiting for us."

Films taken from Royal Air Force fighter aircraft in combat with the enemy are now being used for the instruction ot British pilots in fighting tactics. H.M. the King, visiting a Fighter Command Station in Scotland recently, saw one of these films recording the interception and shooting down of a German raider. It was taken from the attacking British aircraft during the fight. Lined up with the fighter pilots' eight guns there is a ciné-camera. This operates automatically when the trigger-button sets the eight guns in action. It is focused on the target, and makes an exact record of the bullets' path. When the pilot takes his finger off the trigger the guns cease firing—and the camera stops taking pictures. It resumes its work with each burst of fire. On landing, the fighter aircraft is refuelled, given fresh ammunition, and the camera is reloaded. The exposed film, with the pilot's name and the date recorded, is quickly developed, and is viewed by the pilot later. He is thus able to study his own peculiar ways and perhaps to correct mistakes.

The naval base at Scapa Flow was raided by fourteen German aircraft just as dark was falling on Saturday last. A considerable number of bombs were dropped at both land and sea targets. Only one naval vessel was hit, and the damage done was slight.

One of the bombs which fell on the land killed a civilian. It is possible that this first British civilian casualty may have the effect of extending the air war considerably. One raider was shot down at Scapa Flow, and others severely handled by our aircraft.



Part of the armament of the Navy's new motor torpedo boats consists of eight Lewis guns grouped as shown.

EXIT CIVIL AVIATION?

Is It Being Used to the Greatest Advantage for the Empire? Paralysis in the Fourth Arm?

By "McANGUISH," A.F.R.Ae.S.

". . . I am left wondering about the direction of British Civil Aviation."—Mr. O. E. Simmonds, M.P., in the House of Commons, March 7, 1940.

IN a war which is being fought for the vital interests of Great Britain—predominantly material, but also to some extent spiritual, for most of us wish to retain freedom of thought, speech and writing—one might be pardoned for thinking that every resource would be utilised to its fullest extent in the struggle.

But that is far from the truth. Our Government realises that economics is the fourth arm, and so far the war might be more accurately described in general terms as the enforcement of economic sanctions against Germany, backed up by military preparedness—the same sort of thing which the British and French Governments jointly refused to face up to against Italy in 1935 and the following year. But economics is not only the fourth arm of warfare—it is also one of the main reasons for fighting the war. At the present rather primitive stage of man's development, most nations will not fight if they can trade prosperously and if they can retain their own habits of thought without outside interference.

So we are fighting to retain our rights and facilities to trade as well as to prevent ourselves coming under a dictatorship, and the restriction of any of our trading facilities will react disastrously against us, not only after the war, but during it.

And that is what is happening. Civil Aviation is being restricted—drastically. Mr. Simmonds is "left wondering," although there was much in his speech in the debate in the Commons (when Sir Kingsley Wood presented the secret Air Estimates) which indicated that he was not so much wondering as deeply perturbed about the way Civil Aviation is being handled by the present Government. And so is every one else perturbed who has the slightest understanding of the hampering restriction, the strangling prohibition, the ruthless striking down and the blatant handing over to "Big Business" of the young but long-suffering Civil Aviation, a unit of the nation's transport and communications which, allowed to develop properly, will become at least as important as any other unit.

Civil Aviation has two roles to play: the export of civil aircraft and the maintenance of fast transport.

During the twenty years of uneasy peace, it was allowed, very grudgingly by an Air Ministry always preoccupied with the insistent wants of its brother, Military Aviation, to play both roles, but in a decidedly modest fashion. Particularly the export role. Only one firm was supplying the market for the larger-than-three-seater class. That was De Havillands, and several firms were turning out private-owner and club machines. But in the airliner class—well, British Airways had to buy American, to our everlasting disgrace. As the fast messenger, Civil Aviation had gone through the "built-in headwind" era of remarkably slow but remarkably safe aircraft, and was just on the point of trimming its wings and catching up with the fast services of the world—when came the major tragedy which, of course, had been obviously on the way.

Services Curtailed

What happened? Immediately Civil must do Brother Military's work as well as its own—or instead of it, if its own cannot be done. Grudgingly again, the overseas services to India, Australia, China and Africa are allowed to run, but at reduced frequency. The Atlantic service, started most promisingly with *Caribou* and *Cabot*, is stopped, ostensibly because of winter, although Pan American can continue its Clipper service and run to capacity with mails and passengers, many of them British passengers, too. Mr. J. V. Fairbairn, Australian Minister for Air, when returning from the conferences in Canada on the Empire Air Scheme, was only one of them, but a very important one. *And he had to travel by an American line*—and must say so when Dominion reporters ask him his impressions of Atlantic flight.

Why must this be so? Because *Caribou* and *Cabot* have been taken over by the Coastal Command to do work for which Sunderlands were built. Perhaps only to supplement the number of flying boats in use, but one suspects that *Caribou* and *Cabot* are so good at their job that they can do things which the Sunderland cannot. And why could not those responsible for the supply of R.A.F. flying boats have written a specification which would have given them just what they required? It does appear as though civil designers have been forced to make up the deficiencies of the Air Ministry writers of military specifications, for even the Sunderland is a very direct descendant of the *Canopus*.

Adding just one more burden, it seems likely that the Atlantic service will not be restarted again this coming summer, despite some very indefinite statements to the contrary. Unless *Caribou* and *Cabot* are handed back to Imperial Airways, there seems little likelihood, as the big "G" class boats, *Golden Hind, Golden Fleece* and *Golden Horn*, though completed, have not yet been delivered, and much remains to be done before they could be sent off on a scheduled Atlantic service. *Caribou* and *Cabot* can do more towards winning this war as argosies of the Empire's commerce than on Coastal Command work.

But other nations are at work over the oceans, and soon they will be, as one writer put it with a certain disregard for metaphor, "digging themselves in on the Atlantic air routes." The Dutch have their eyes on the South Atlantic, and survey flights will be made this spring by a Douglas DC 3 from Lisbon via the Cape Verde Islands to Paramaribo in Dutch Guiana. There is also a mission from the four Scandinavian countries now in America discussing with the Post Office and Civil Aeronautics Authority a projected service from those northern countries to U.S.A.

One in 300

And against this background of competition from other nations Sir Kingsley Wood, in presenting the Air Estimates, says: "First things must come first, and I am afraid, much as we would wish it otherwise, that the progress of Civil Aviation must inevitably be retarded." So are *we* afraid, Sir Kingsley—afraid that you and the Government may not only do irreparable damage to Civil Aviation as an agent of peace, world commerce and international culture, but that you may not utilise its war-winning value as it should be used, as something with which to make the economic warfare more effective—a weapon of economic warfare, if you will. Economics is the fourth arm, but deprived of communications and transport, it is paralysed. And the air is the fastest transport highway.

Sir Kingsley Wood says "that at this stage of the war we must husband our resources and use them in the fullest support of our military effort." Everyone agrees about that, but there is some difference of opinion about just how they should be used.

Here let a few figures intrude, and let us see just how much military production would have to be curtailed to supply the needs of even a completely unhampered air transport system. Capt. Balfour, in answering a question in the House on February 28 said that the number of British civil aircraft operating on the overseas routes on August 31, 1939, was 63, and on February 27, 1940, was 45. A tragic reduction—but that is not the point.

The point is that with 100 civil aircraft on the overseas routes a very active policy could be implemented. Even

the 63 would be fairly satisfactory, but with 100, development could be vigorous. Assume a life based on obsolescence as short even as five years (*Hannibal* lasted nine years until her tragic disappearance recently, taking with her passengers and crew whose attainments, apart from any other consideration, made them men who are needed in this world). Allow for some crashes, and take the average life as three years, again a severe figure. Then only 33 aircraft per year would be needed to keep this civil fleet always going. Even sixteen per year would be a very useful number.

Such a figure, 33 aircraft per year, is but a minute fraction of total aircraft production. Total production of this country is unknown to all except a very few—certainly to me—but one may hazard a guess from reading American technical papers that it is well over 10,000 per year. It might even be 30,000—one can only guess. Even if it is as low as 10,000, the production of 33 civil aircraft per year is about *one-third of one per cent. of military production*. As a figure it looks like this: 0.3 per cent. A figure which is just about the equal of a pinch of salt in a recipe—and just about as indispensable. Add "a pinch of Civil Aviation" to the wartime stew, Sir Kingsley, and stir vigorously. The result will exceed your fondest expectations. It would make the R.A.F. 0.3 per cent. weaker—instead of having 300 units of strength it would have 299—but the war is not going to be won or lost by as small a margin as that.

If events continue in this country as they are going at present, it seems that Civil Aviation would have a happier life under any other Ministry than under its present grudging parent, the Air Ministry. Even the Ministry for Economic Warfare might nourish it better!

Big Business and the Independent Operators

In a recent issue of *Flight* [March 7, page 209.—ED.] appeared an article setting out the views of the "independent" airline operators about the proposed Air Ministry action to prevent them running services and to acquire some of their aircraft. There were some indications that the independent companies thought they were going to be permanently suppressed, and the field of air transport, both internal and overseas, left completely open to the railway and other big financial groups.

With my curiosity aroused, a little investigation was undertaken at the Inland Revenue Office in Bush House, inspecting the lists of shareholders and boards of directors of various companies. (This can be recommended as good sport for a wet day and only costs one shilling per company. One gets all the Christian names of the directors in full and, more interesting still, their former names. Sometimes it is just a "von" changed to a "de," but it may be as thoroughly done as "Clyde," formerly "Oppenheimer.")

Flight's article says: "*If they* (the shareholders in Imperial Airways and British Airways) *exercise this right* (that of conversion of their shares to stock in the new British Overseas Airways Corporation) *it is at once obvious that the big financial groups and various railway companies will own a considerable amount of stock in the Corporation.*"

Also we have lately had announcements which completed the list (specially reduced—why? because of war?) of the members of the Corporation. The list now reads: Chairman of the Corporation, the Hon. Clive Pearson; Deputy Chairman, Mr. Irvine Geddes; Director-General, the Hon. Leslie Runciman; members, Messrs. Harold Brown and Gerard d'Erlanger. Only five members instead of the eleven or seventeen laid down in the Act.

Looking first at the share list of Imperial Airways, it proves to be a staggering document of 800 pages. With its issued share capital of £1,623,869 divided among 5,238 names, the average holding is only just over £300. And only eight of the holders possess more than 10,000 £1 shares each. Moorgate Nominees 19,200, and Orient Steam Navigation 25,000, are among these.

No, Big Business is not here, at least not overwhelmingly. (Probably founded too early, before Big Business realised that civil aviation was going to make itself felt.) The list of directors is long, including the Government directors appointed to watch national interests.

British Airways is in a smaller volume. Its issued share capital is 363,204 shares of £1. The name of Mr. Gerard d'Erlanger is noticed as a director, as also is Mr. W. C. Tomlinson, while the Hon. Clive Pearson is chairman. Captain Harold Balfour was formerly a director in 1935, and the holder of 9,000 shares, but the list shows that these were transferred on May 24, 1938, to the joint account of J. H. Macdonald and J. L. Walsh, of 47, Parliament Street, S.W.1.

The principal shareholders in the company are: British-Continental Airways, 63,204; Hillman's Airways, 63,947; the Macdonald and Walsh joint account, 130,868; Moorgate Nominees, 86,053; the Hon. Clive Pearson, 1,000; W. D. L. Roberts, 9,131; and the joint account of Messrs. Hunter and Morgan-Grenville, of 47, Parliament Street, 9,000.

(*To be continued next week.*)

Cargo Service to the Jungle

FROM far out in the Philippines comes an interesting story about a Bellanca Aircruiser and its daily work in carrying heavy cargo for a mining company.

The world-wide Elizalde Company is a Philippine organisation and probably one of the richest companies in the world. It employs 10,000 workers and is engaged in about a dozen kinds of business, from the manufacture of paint to shipping, and from wine-making to gold mining.

It is in the last-mentioned activity that the Bellanca has proved itself indispensible to the success of the mine. The Davao Gold Mine, on the Island of Mindanao, is the Elizalde subsidiary directly responsible for the plane's operation, and word that has been received tells of not only tractors and a truck as the aeroplane's cargo, but such articles as a diesel electric power unit, electric elevator hoist for a mine shaft, large electric motors and generators, sinker pumps, an automatic mine car loader and air compressors. The largest piece carried was the main body of a diesel engine, weighing, together with 200 pounds of tying-down gear, 4,095 pounds. The work is similar to what has gone on for many years past in New Guinea, where gold mining companies are served by several air transport companies.

A record was believed established when 34,000 pounds of cargo was carried in two hours and 20 minutes. On a year's operation the Aircruiser averaged 3,580 pounds of cargo per day.

Of the facilities and flying conditions between Davao and the mine, the story is best told in the letter written by the head of the aviation department to the Bellanca Aircraft Corporation:—

"The airport at the mine is located in a dense mountainous jungle, 28 miles east of Davao, and the company long ago gave up the idea of trying to build a road into such difficult country. The only practical way of developing the mine was by airplane transportation. The airport is 3,000 feet long of which about 2,700 feet at a 5 per cent. grade is usable. It is located in a blind canyon between two mountains, and another mountain rises up to 7,000 feet at the east end of the runway. The elevation of the field is 1,600 feet. The only way in and out is from the west. All landings are made towards the east, and 80 per cent. of such landings are downwind (5 to 12 m.p.h.) due to peculiar air conditions in this locality. It is not unusual to land with a ground speed in excess of 95 m.p.h. when a good tail wind is blowing. It is usually very gusty in the late mornings as the tail wind increases, and the landing then becomes more difficult. The landing gear has taken many a beating, and so far has shown no signs of weakness. Over 1,700 landings have been made during the first year, which is more than most airplanes get in three or four years of flying.

"The topography around the field is such that a landing *must* be made after passing the edge of the field, as there is no chance to turn around in the narrow canyon. To change your mind at this point would be disastrous."

Middle East C.-in-C. Visits Turkey

AIR MARSHAL SIR WILLIAM MITCHELL, Commander-in-Chief of the Air Force in the Middle East, and General Jaunaud, who commands the French Air Force in the Eastern Mediterranean, arrived in Angora on March 9 and paid official calls on various Ministers and heads of the armed forces.

O.G. FOR SOUND

A Clever Instrument for Sound-Locator Training : Aircraft and Other Noises Realistically Imitated

"Flight" photograph.

The Sound-Locator Trainer at work. The pupil is behind the machine and the instructor in front.

WHEN Sqn. Ldr. George Reid brought out his "Aptitude Tester" for prospective aircraft pilots many years ago, the invention was generally welcomed because the instrument made possible the easy determination of a pupil's likelihood or otherwise of taking to flying readily.

Some years ago that device was followed by the Link Trainer, in which the pupil was taught to fly entirely "on his instruments." Still more recently, the Link Trainer has been adapted by Sqn. Ldr. Roy Harben to instruction in visual "flying on the ground."

And now comes the latest device for training personnel cheaply and rapidly on the ground. This time the objective is not flying training, but the training of crews for the sound locators used by the air defences of all countries. Known as the "O.G.," this trainer is of foreign origin, but the British rights have been acquired by Savage and Parsons, Ltd., of Watford By-Pass, Bushey, Herts. Maj. Jack Savage will be well known to all readers of *Flight* as the proprietor of the sky-writing concern which bears his name. He has also done a great deal of work on special types of searchlights, but that is another story.

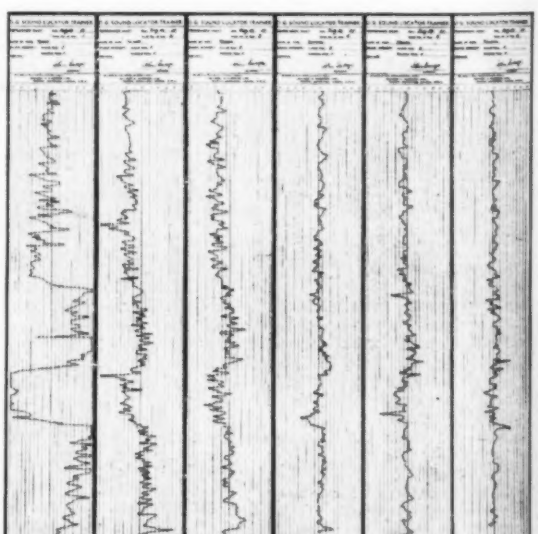
The Savage O.G. Sound-Locator Trainer produces in the ears of the pupil a most realistic imitation of the sound which the listener hears in a real sound locator. Not only is the noise of aircraft engines represented, but the instructor operates a small wheel which gives the pupil the impression that the approaching or receding aircraft has turned to right or left. The task of the pupil then is to turn his wheel until the instrument is "pointing" towards the aircraft.

If that were all, the instrument would be ingenious, but it does far more than this. Not only can the engine noises be made to represent a single-engined aircraft, a twin-engined aircraft, and a whole squadron, but the general level of intensity of aircraft noise can be varied as well. Furthermore, extraneous or parasitic noises can be produced, and these can be of varying intensity, thus representing very realistically the conditions that may obtain on different days and nights.

Obviously a start is made without any parasitic noises, and as the pupil gains experience the noises are increased and/or the loudness of the aircraft reduced until it is almost swamped. It is quite surprising how, even after a fairly short course, one becomes accustomed to distinguishing between aircraft and parasitic noises.

The writer of these notes was tested on the Savage O.G. Sound-Locator Trainer, and the fact that his hearing is more keen on one ear than on the other was clearly brought out; the average location of the wavering track traced on the chart was consistently on one side of the centre line. When he realised what was happening he tried to correct for the difference in hearing, and the result was an over-correction which brought the track slightly on the other side of the centre line.

In actual operation, the trainer is occupied on one side by the instructor and on the other by the pupil. The



Series of charts showing progress of a typical pupil in six lessons of five minutes each. The left-hand chart represents the first lesson. The charts are read from the bottom upwards.

former manipulates different controls which give the pupil the impression that an aircraft is approaching, passes over and flies away. To make the test more difficult the instructor makes the aircraft change course frequently. The task of the pupil is to follow these changes of course, and the degree to which he succeeds is recorded on a chart, the centre line of which corresponds with the theoretical position of the aircraft at any given moment. If the pupil were 100 per cent. perfect, and if there were no time lag between the instant when the instructor changed the position of the aircraft and that at which the pupil got it located again, the line on the chart would be perfectly straight, and would lie along the printed centre line. In practice, of course, a very different chart is produced. At first the pupil wanders all over it, swinging off first to one side and then to the other, but in a surprisingly short time he learns to follow the aircraft by turning the wheel (rather like the steering wheel of a car) provided for him.

Internal Secrets

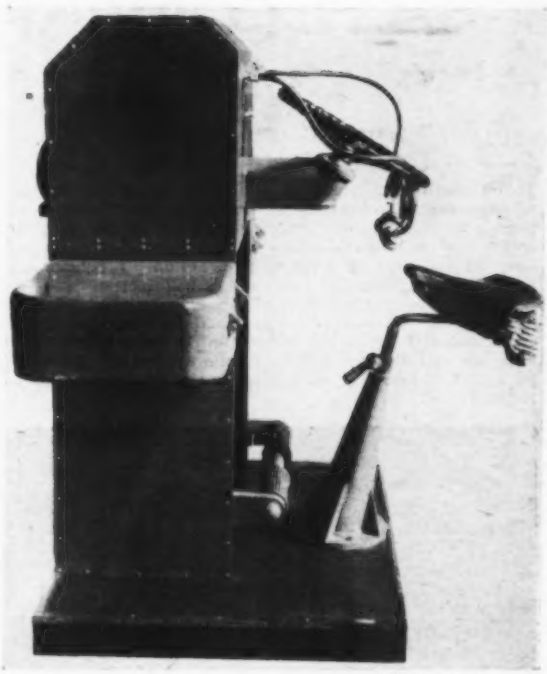
Our illustrations show the external appearance of the Savage O.G. Sound-Locator Trainer. The interior contains three main units: the sound displacement unit, the recording unit, and the power pack.

The sound displacement unit consists of two sections, one acoustic and the other mechanical. The former has a conduit of semi-circular plan form and of square cross-section. The ends of this conduit, which is made of non-resonant material, are connected by exponentially tapered tubes to the earphone adaptors. The base of the conduit is slotted, and the moving sound unit, which is a sensitive telephone receiver, is carried on to a pivoted arm below the conduit. As the unit is swung by the instructor from side to side, the lengths of the sound paths to the listener's ears are altered, thus producing the impression that the aircraft is turning to left or right.

The mechanical part of the unit is a differential mechanism which couples the instructor's handwheel through a gear train to give the correct ratio of sound displacement to travel of chart bead. The other bevel of the differential is coupled to the pupil's handwheel. The chart bead, it might be mentioned, is carried on a steel cord driven by the instructor's handwheel. This bead is used by the instructor for following the aircraft course previously printed on the chart.

"Flight" photograph.

The instructor's control panel and chart drum.



"Flight" photograph.

The "victim's chair." This side view of the trainer shows the pupil's seat, handwheel and earphones. A frictior brake is provided for the wheel so that the torque require to turn the wheel can be varied.

Control of the recording unit is by two groups of knobs, one group on each side. Those on the right control the aircraft sounds, and those on the left the parasitic noises. These, it might be pointed out, are "fixed in space," and give no binaural effect. The drum of the recording unit makes one revolution in five minutes. It carries the course chart, and on two guide bars above it is a pencil carriage which carries a pointer by means of which a direct reading of the pupil's errors can be read from a scale.

Sound Films

The sound generating units are carried in boxes on each side of the machine. The noises are derived from sound films, which, of course, give no scratching noises and which never wear out. They are similar in principle to the sound films of the cinema, but are recorded on circular discs instead of on tape. By means of an exciter lamp, an interrupter disc and an optical system, the light beam is thrown on the sound disc, the sound track interrupting the light and so causing a varying amount of light to fall on a photo-electric cell. The output from the photo-electric cell is amplified by the amplifier unit.

Each sound disc carries three sound tracks, the track required being obtained by rotating the selectors provided. The effect of imitating the approach and subsequent receding of the aircraft is obtained by a rheostat, mechanically coupled to the recording drum, and wired in series with the exciter lamp of the sound-generating unit. For the first ten degrees of rotation of the drum no resistance is used. After that the resistance is inserted, and the intensity falls to a minimum. Then begins the actual approach, the sound level increasing during the next 135 degrees of drum rotation, and decreasing for the rest of the drum's rotation, until it reaches a minimum value just as the graph is completed.

Unfortunately, space does not permit of a more detailed description of the electrical and optical systems of the machine, but it is hoped that sufficient has been said to indicate that here is a serious piece of equipment which should have great use in training and giving refresher courses to sound locator crews.

CORRESPONDENCE

The Editor does no' hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

SPOTTING FOR WARSHIPS

Königsberg Action Recalled

I AM writing to correct a statement which you made on page 188 of your issue of the 29th. You state on this page that the *Sea Fox* which took part in the *Graf Spee* action was the first machine in the history of warfare to spot for the guns of a warship in action. I believe I am right in saying that this statement is incorrect.

Lately I have been reading *The Königsberg Adventure*, by E. Keble Chatterton. This book describes the tracking down and destruction of the German cruiser *Königsberg*, and later the end of the 4.1 guns of the cruiser which her crew took with them after their ship had been destroyed in the Rufiji Delta.

Because of the mudbanks and shallowness of the rivers forming the delta, up which the *Königsberg* went on the spring tides and failed to get out again, the Navy had to employ the monitors *Severn* and *Mersey*.

On July 6, 1915, these monitors approached to an estimated distance of 10,800 yards, and opened fire over the trees which completely hid the cruiser. Their fire was controlled by a Henry Farman machine piloted by Flight-Commander J. T. Cull, with Flight Sub-Lieutenant Arnold as his observer. This attack failed because the enemy's fire was so accurate. The spotting machine had to return home before the end of the action. On July 11 the attack was repeated, and a Henry Farman machine, again piloted by Cull and with Arnold as observer, spotted for the guns. This time the *Königsberg* was defeated, but with one of her very last shots she disabled the Henry Farman and the machine came down in the river and its occupants were rescued by the monitor *Mersey*.

The monitors had got the range so well while the aircraft was spotting that nearly all subsequent shots were hits.

London, N.11. I. MAILER.

PROPELLER TIP VORTICES

Phenomenon Repeated with Models

IN a previous issue of *Flight* there was a touched-up photograph of fog trailing from the tips of the propeller blades of a Hampden bomber. This phenomenon is, of course, due to the high velocity of the core of the tip vortices, and it struck me that it would be interesting to see if these could be rendered visible in a model airscrew with the aid of a smoke jet.

MODEL AIRSCREWS MAKE VORTICES. On the left is a fine-pitch airscrew, while the middle and right-hand pictures show airscrews of coarser pitch and smaller diameter. The speed was 1,200 r.p.m.

By using a stroboscope I was able to follow the whole development and subsequent behaviour of the vortices in great detail, and it therefore struck me that some photographs would be of interest.

I have enclosed the three best of sixty exposures. In each case the propeller was rotating at about 1,200 r.p.m., and the exposure was about 1/3,000 sec.

In print No. 1 a fine-pitch propeller of 17in. diameter was used, and it will be seen that three vortices are visible; these also render the jet contraction visible.

In prints 2 and 3 a 14in. propeller of fairly coarse pitch was used, and in both cases the blade has just passed and has left the vortex behind it. The flow downstream from the screw is too turbulent for more than one vortex to show clearly. No. 2 shows clearly the structure of a vortex. The reduced definition towards the centre indicates the greater velocity.

Hounslow. J. DUBBURY.

Club Flying in India

THE number of pilots in training at the seven subsidised flying clubs in India has trebled in the past year. The number of 30 at the beginning of December, 1938, had become 88 by December, 1939. During the financial year 1938-39, 64 pilots were trained while for the year 1939-40 it is estimated that 92 will be the total.

Provincial Governments are taking an increasing interest in the flying clubs. The United Provinces Government gives a grant to the United Provinces Flying Club as does the Punjab Government to the Northern India Flying Club. The Government of Bengal has a similar scheme under consideration.

Expanded Neutral Services

THE airline companies of the "Oslo Powers" some time ago agreed between them to expand their activities as from March 1. There will be three daily services from Scandinavia to Amsterdam, and four as from March 15 when the direct service from Oslo to Amsterdam is reopened.

SERVICE AVIATION

Royal Air Force Awards and Announcements

DOG FIGHTERS: The story of how the already-famous "twenty-one-year-old New Zealand officer" and a Sergeant Pilot were engaged by Messerschmitts has been told. The sergeant was forced to land, as was the New Zealander, though he brought down a Messerschmitt, making his third, or possibly fourth, victim. Here are the pilots concerned.

Awards

THE King has been graciously pleased to approve of the following awards for gallantry and devotion to duty in the execution of air operations:—

Awarded the Distinguished Flying Cross

Sqn. Ldr. Kenneth William NIBLETT, Acting Flt. Lt. Robert Voase JEFF, Acting Flt. Lt. Richard Hugh Antony LEE, Acting Flt. Lt. Maurice Victor LONGBOTTOM, Acting Flt. Lt. Robert Henry NIVEN, Acting Flt. Lt. Geoffrey Middleton WYATT, F/O. Alastair Dyson PANTON.

The highest qualities of leadership and devotion to duty have been displayed by one of the above officers as flight commander of a squadron employed on long-distance day and night strategical reconnaissances. Another officer is described as an outstanding flight commander and a reliable and brilliant pilot. On one occasion he pursued an enemy aircraft for 20 minutes, finally forcing it to land and fall into Allied hands. A third has set a magnificent example of keenness and efficiency as a flight commander. He intercepted an enemy aircraft over the English Channel and shot it down in flames. Two of the officers have been pioneers in a new method of aerial photography. They have taken overlapping photographs of many enemy defences. Another officer is described as "an inspiration to his squadron."

Awarded the Distinguished Flying Medal

Sgt. William Joseph CRONIN, Sgt. Frank MILLER, Sgt. Alexander Cameron THOMAS, Sgt. David PENNINGTON, L.A/C. Sidney CULVER, L.A/C. George HAWKINS, A/C. 1st Class Henry Arthur George FERRE, A/C. 1st Class Frederick John ALLAM.

Several of the above are described as skilful observers and navigators. One is decorated for good work in a raid on Wilhelmshaven, when his aircraft scored a direct hit on a German battleship, and for his conduct in the 25-minute engagement over the North Sea on January 10 between nine Blenheims and five Messerschmitt 110s. Among the air gunners, one receives the D.F.M. for cool and effective handling of his gun during the engagement of January 10, in which his aircraft occupied a dangerous position. Another has set a splendid example of valour and fortitude. He has shown zeal, ability and devotion to duty. A wireless operator among the recipients was the first member of his squadron to carry out a second reconnaissance over enemy territory, flying in intense cold to nearly maximum endurance of the aircraft and over strongly defended zones. His ability had a very good effect on the aircraft crews when the squadron had suffered heavy losses.

Dress Regulations

AN abridged edition of the Air Ministry Dress Regulations for officers of the Royal Air Force has now been issued by H.M. Stationery Office at the price of 2s. It may be purchased direct from the Stationery Office or through any bookseller.

The booklet deals with R.A.F. officers' war-time requirements, and all details of uniform not normally used in time of war have been omitted. It contains numerous illustrations of uniform and badges. The booklet should be consulted in all cases of doubt by the tailoring trade.

A New Badge

APPROVAL has been given by an Air Ministry Order published recently for a distinguishing collar badge to be worn by officers of the Royal Air Force Volunteer Reserve employed as education officers. The badge, which is made of gilt metal, consists of crossed flambeaux, surmounted by an eagle with outstretched wings. It will be worn on the collar of the Service dress jacket, with the letters "V.R." placed centrally above it.

Casualties

THE Air Ministry regrets to announce the following casualties on various dates:—

KILLED IN ACTION.—Act. Sgt. D. J. Bendall (580596); Flt. Sgt. G. A. Corby (561526); F/O. L. R. Field (37346); A/C.2 L. B. Hughson (621109); A/C.2 J. R. Hunter (625656); P/O. J. S. Mitchell (41607); Act. Sgt. J. C. Murdoch (580799); L.A/C. E. H. Prior (540726); A/C.2 T. E. Smith (626998); Sgt. M. Wiffen (580312).

PREVIOUSLY REPORTED "MISSING," NOW REPORTED "KILLED IN ACTION."—A/C.1 P. T. Jones (540554).

MISSING, BELIEVED "KILLED IN ACTION."—L.A/C. G. Peterson (520852); A/C.2 L. H. Trumay (531133); A/C.1 R. J. Webber (569704); Flt. Lt. A. N. Wilson (90300).

WOUNDED IN ACTION.—A/C.2 J. P. Smith (808285).

MISSING.—F/O. J. C. H. Blake (39196); Sgt. A. E. A. Bruce (740084); L.A/C. A. R. Chapman (534704); Sgt. L. C. Cond (580724); F/O. N. Hawxby (39735); Flt. Sgt. A. Hill (590559); L.A/C. T. F. Johnson (538052); L.A/C. F. G. Jones (567277); A/C.1 S. N. Middleton (611040); Sgt. T. S. Weightman (564455); Group Capt. H. A. Whistler, D.S.O., D.F.C., p.s.a., i.d.c. (03100).

KILLED ON ACTIVE SERVICE.—Sgt. R. S. S. Black (740580); Sgt. G. Breese (754722); L.A/C. G. A. Carter (747780); P/O. D. W. Coysh (41071); Sgt. B. E. Currie (740647); F/O. A. Law (73602); F/O. L. H. Leader (39795); A/C.2 W. Ledsham (630792); F/O. R. H. Lemon (70391); P/O. P. F. N. Lomax (41853); A/C.2 W. Mahon (624822); F/O. B. A. Mortimer (37979); Sgt. T. Owens (565435); Flt. Sgt. W. C. Parkes (562843); F/O. C. P. S. Smith (70629); Sgt. L. G. J. Smith (758004); L.A/C. A. R. Sutcliffe (740751); F/O. J. N. Thornewill (39834); Sgt. P. F. H. Thurgar (580293); P/O. H. A. Trenchard (40271); Sgt. J. F. Wales (754725); Sgt. E. C. Warren (758046); L.A/C. F. A. Webster (759344).

DIED ON ACTIVE SERVICE.—Sgt. A. A. G. Dowle (514307); A/C.2 J. Dunnachie (972716); A/C.2 C. Farnworth (638751); Cpl. E. A. Ferris (561539); Cpl. R. M. Graham (59460); L.A/C. A. W. Lynch (755017); Cpl. G. E. J. Misselbrook (565756); A/C.2 S. S. Outten (900798); A/C.2 J. R. Ross (973923); A/C.1 A. J. Rule (770830); Cpl. S. O. Slater (527163); L.A/C. A. Sweet (42250); L.A/C. J. Taylor (334630); A/C.2 J. E. Taylor (747494); L.A/C. T. M. Thompson (525225); A/C.2 F. T. Tyler (649014); Sgt. L. A. Vickerage (510534); A/C.1 D. Wilson (628821); A/C.1 C. V. M. Winn (551514); A/C.2 W. Wood (908733).

R.C.A.F. H.Q.

AN Overseas Headquarters of the Royal Canadian Air Force has now been established in this country. Hitherto there has only been an Air Liaison Office, and the new development marks an important stage in Canada's progressive contribution to the Empire's war effort. The Commanding Officer of the new Headquarters is Group Captain George Victor Walsh, M.B.E.

Appointments of Royal Duchesses

THE KING, states the *London Gazette*, has been pleased to approve of the appointment of the Duchess of Kent to be Commandant of the Women's Royal Naval Service, and of the Duchess of Gloucester to be an Air Commandant, Women's Auxiliary Air Force.

Service Aviation

EXTREMITIES: The stern of a neutral vessel photographed from a low-flying machine of the Coastal Command (its wing tip may be seen).

Promotions

The Air Ministry announces the following temporary promotions made with effect from March 1, 1940:—

WING COMMANDERS TO BE GROUP CAPTAINS.

Fulljames, R. E. G., M.C.; Sugden, R. S., A.F.C.; Fletcher, A. W., O.B.E., D.F.C., A.F.C.; Gardiner, G. C., D.S.O., D.F.C.; Massey, H. M., D.S.O., M.C.; de Burgh, D. H., A.F.C.; Lock, H. G. W., D.F.C., A.F.C.; Porter, C. E. V.; Gayford, O. R., D.F.C., A.F.C.; George, R. A., M.C.; Lloyd, K. B., A.F.C.; Openshaw, E. R., A.F.C.; de Putron, O. W.; Rowley, H. V.; Mackworth, P. H., D.F.C.; Smylie, G. F., D.S.C.; Iles, L. M., A.F.C.; O'Neill, H. D., A.F.C.; Lewis-Roberts, A. O., D.F.C.; Johnston, G. S. N., O.B.E.; Churchman, A. R., D.F.C.; Spackman, C. B. S., D.F.C.; Vincent, S. F., A.F.C.; Mason, J. M., D.S.C., D.F.C.; Oddie, G. S., D.F.C., A.F.C.; Ledger, A. P., M.B.E.; Whitford, J., O.B.E.; Walmsley, H. S. P., O.B.E., M.C., D.F.C.; Carnegie, D. V., A.F.C.; Steele, C. R., D.F.C.; Baker, J. W., M.C., D.F.C.; Ritchie, A. P., A.F.C.; Ellwood, A. B., D.S.C.

SQUADRON LEADERS TO BE WING COMMANDERS.

Maurice, A. P., D.F.C.; Routh, E. J. D.; Stilwell, C. H.; Saker, H. J., M.V.O.; Ffoulkes-Jones, E. J.; Stainforth, G. H., A.F.C.; Bruce, R. S., M.B.E.; James, W. E.; Golder, W. H., D.S.M.; Day, W. R.; Hatcher, C. J. W., A.F.C.; Henwood, F. H. D., D.F.C.; Sinclair, F. W., D.F.C.; Bailey, S. J., M.B.E.; Stewart, L. H.; Harrison, C. W.; Willetts, A. H.; Cole, R. A. A.; Chichester, P. G.; Taaffe, R. T.; Hopkins, E. D. MacL.; Mason, N. W. F.; Hardy, S. H.; Pike, T. G.; Pigott, O. R.; Allinson, N. S.; Wright, H. M. S.; Harvey, G. D., D.F.C.; King-Lewis, A.; Spreckley, H. D.; Healy, E. A.; Hayes, G. W.; Dalton-Morris, L.; Cator, F. G.; Young, N.; Chamberlain, G. P.; Smythies, F. P.; Cohu, J. M.; Woodin, J. H.; Grace, C. F. H.; Thomas, J. E. G.-H., D.F.C.; Beardsworth, G. B.; Holmes, W. T.; Nowell, H. E.; Harris, S. H. V.; Cadell, C. S.; Stemp, G. C.; Dickens, L. W., A.F.C.; Gillmore, A. D.; Hodder, F. S.; Stanley-Turner, G. N. J.; Fuller-Good, J. L. F.; Tindall, J. A.; Horry, T. S., D.F.C., A.F.C.; Ashton, G. R., A.F.C.; Damant, F. K., D.F.C.; Bardon, H. R.; Tattersall, W. A.; Warburton, J.; Kennedy, W. M. C.; Keary, J. D'A.; Pearson-Rogers, H. W.; Coggle, C. K. J.; Tuttle, G. W., D.F.C.; Steedman, E. B.; Rowland, F. C.; Cannon, L. W.; Denny, F. M.; McEvoy, T. N.; Hawkings, J. A.; Hutchinson, J. H.; Flint, M. C. W. C., M.C.; Kellett, R., D.F.C., A.F.C.; May, F. M. V.; Sharp, A. C. H.; Bartholomew, G.; Ford, R. J. A.; Coaker, C. F. C.; Atcherley, R. L. R.; Legg, R. J.; Donkin, R. H.; Proud, H. J. G. E.; Slater, J. C. C.; Fagan, T. P. P. F.; Fallick, E. E.; Nash, R. R.; Jones, J. R.; Moloney, T. F.; Wheeler, A. H.; Evans-Evans, A. C.; Buckle, N. R., M.V.O.; Hall, F. W. H.; Heard, C. M.; Gray, S. H. C.; Wilson, R. C.; Griffiths, J. F., D.F.C.; Campbell, W. G.; Hatcher, V. G. A., A.F.C.; Montgomery, A. H., M.B.E.; Dickens, T. C.; Fitch, I. J.; Southey, H. F. G.; Ward, E. L. S.; Bowles, J. E. W.; Bennett, L. C.; Roberts, D. N., A.F.C.; Webb, E. B.; Lowe-Holmes, P. W.; Beamish, F. V., A.F.C.; Ryley, D. W. R.; Huxham, G. H.; Patch, H. L.; Merton, W. H.; Bett, A. P.; Hammond, A. V.; Parker, H. M. G.; Taylor, A. E.; Ewens, F. G. H.; Shaw, G. H.; Norwood, J.; Yarde, B. C.; Evans-Evans, H. A.; Cheshire, W. G.; Finch, E. S.; Reynolds, J. H. McC.; Whitley, J. R., A.F.C.; Harvey, A. V. (A.A.F.); Briggs, Ll. R. (A.A.F.); Farquhar, A. D., D.F.C. (A.A.F.); Norman, H. N. St. V. (A.A.F.R.O.).

FLIGHT LIEUTENANTS TO BE SQUADRON LEADERS.

Whitaker, R., M.B.E. (retired); Harvey, W. A. (retired); Montgomery-Moore, R. J. (retired); Bell, J. W., D.S.M. (retired); Dowse, L. E.; Altham, J. B.; Fraser, B. A.; McIntyre, K. J.; Evans, C. A. H.; Vivian, R. L.; De Gruyther, A. A.; Spencer, D. G. H.; Gordon, J. A. G.; Slade, E. G.; Southwell, J. Mack.; Musson, R. G.; Elsworthy, S. C.; Holmes, A. J. (R.A.F.O.); King, L. L., D.F.C. (R.A.F.O.); Barrow, H. A. J. de S. (R.A.F.O.); Butler, G. C. (R.A.F.O.); Tatnall, J. B. (R.A.F.O.); Winn, R. I. B. (R.A.F.O.); Carey, A. M. (R.A.F.O.); Heyworth, J. H. (R.A.F.O.); Lydall, D. W. (R.A.F.O.); Atkins, J. C. (R.A.F.O.); Ward, Hon. E. F. (R.A.F.O.); McAulay, W. McA. (R.A.F.O.); Mason, F. G. (R.A.F.O.); Hilton, F. W. (R.A.F.O.); Kirkpatrick, I. (A.A.F.); Anderson, M. F. (A.A.F.); Iles, G. B. (A.A.F.); Watson, R. H. (A.A.F.); Le May, W. K. (A.A.F.); Vick, J. A. (A.A.F.); Corry, R. T. (A.A.F.); McComb, J. E. (A.A.F.); Perry, G. V. (A.A.F.R.O.); Guinness, T. L. E. B., M.P. (A.A.F.R.O.).

Accountant Branch.

WING COMMANDER TO BE GROUP CAPTAIN.

Miller, T. C., M.C.

SQUADRON LEADERS TO BE WING COMMANDERS.

Adams, J. M.; Humphrey, E. V.; Deane, W. W.

FLIGHT LIEUTENANTS TO BE SQUADRON LEADERS.

Crowther, H.; Cassels, R.; Calder, W. S; Connor, H. D.; Yiend, D. A. K.; Pratt, R. D.; Chegwidden, L.; Wallett, N.

Commissioned Engineer Officers.

FLIGHT LIEUTENANTS TO BE SQUADRON LEADERS.

Brown, J. T.; Atkins, J. E.; Guttery, T. E., M.B.E.

Royal Air Force Gazette

Royal Air Force

General Duties Branch.

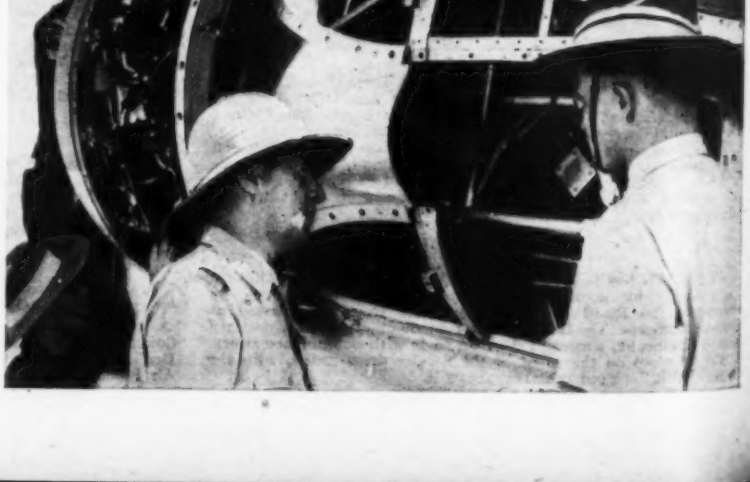
The following Pilot Officers on probation are confirmed in their appointments on the dates stated:—(Dec. 19, 1939) C. J. T. Jones; (Jan. 17) R. W. Clarke, R. N. H. Courtney, J. C. Freeborn, C. L. Hulse, A. L. Ricalton, N. C. H. Robson; (Jan. 22) L. G. H. Kells; (Jan. 23) J. E. M. Collins.

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers on the dates stated:—(Oct. 8, 1938) G. M. D. Roberts; (Jan. 23) K. T. H. Stoney.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation on the dates stated:—(Nov. 5, 1939) B. C. Paton; (Nov. 13, 1939) K. M. Bastin; (Jan. 15) P. M. Thurtle, W. M. Colby, I. Custerton, R. K. Keating; (Jan. 27) J. V. Baker, J. C. Cunningham, N. G. Dryburgh, S. H. Palmer.

Group Capt. J. J. Breen, O.B.E., is promoted to the temporary rank of Air Commodore (Feb. 20); Sqn. Ldr. R. S. Darbyshire is placed on the half-pay list, scale B, from March 22 to 31, 1939, inclusive; F/O. (now Flt. Lt.) P. W. Townsend is placed on the half-pay list, scale B, from Feb. 23, 1938, to March 4, 1938, inclusive.

The following Flying Officers are promoted to the rank of Flight



AUSTRALIAN HUDSON: Group Captain H. F. De la Rue inspecting one of Australia's new Hudsons. These machines have Twin Wasp engines.

Lieutenant:—(March 6) K. Slater, J. N. W. Farmer, G. E. Ford, R. N. Lambert, A. W. Lee, G. M. Wyatt, V. E. Marshall, J. D. Harris.

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—(Dec. 31, 1939) E. F. Tonge; (Jan. 24) F. C. Gibbs; (Feb. 18) E. W. W. Ellis, P. E. Barnes; (March 5) P. C. Lambert.

The following Flying Officers relinquish the acting rank of Flight Lieutenant on the dates stated:—(Nov. 20, 1939) J. D. V. Porter; (Dec. 12, 1939) E. J. S. Jones; (Dec. 18, 1939) D. H. MacKay; (Feb. 4) G. W. C. Gleed; (Feb. 10) F. Hume.

P/O. W. J. Mulholland resigns his short service commission (March 1).

The short service commissions of the following are terminated on cessation of duty on the dates stated:—(March 5) Pilot Officer on probation J. A. Caslaw. Acting Pilot Officers on probation:—(Feb. 4) W. E. C. Hagger; (March 4) P. J. Frisby; (March 6) J. V. Baldwick.

Equipment Branch.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—(Jan. 6) L. A. Jackson, B. O. Cannon; (Jan. 8) H. F. Lovell, E. J. Stephens, J. W. Lamb.

Medical Branch.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—(Jan. 9) (seniority Jan. 9, 1939) G. A. Baker, M.B., B.S.; J. G. Field, M.B., Ch.B., M.R.C.S., L.R.C.P.; (Jan. 9) (seniority Jan. 15, 1939) G. James, M.R.C.S., L.R.C.P.; (Jan. 9) E. B. Bright, M.B., Ch.B.; E. C. Easson, M.B., Ch.B.; J. L. W. Walls, L.R.C.P. and S.; (Jan. 23) (seniority Jan. 23, 1939) K. R. Redmond, M.B., B.S.; (Jan. 23) M. O. Richardson, M.R.C.S., L.R.C.P.

Dental Branch.

F/O. W. R. Foreman, L.D.S., is promoted to the rank of Flight Lieutenant (Jan. 9).

Commissioned Administrative Officer.

Warrant Officer R. W. Flegg is granted a commission for the duration of hostilities as Flying Officer on probation (Dec. 14, 1939).

Erratum.

In the *Gazette* of Nov. 21, 1939, notification concerning W/O. P. F. Overton. For Oct. 28, 1939, read Sept. 28, 1939.

Princess Mary's Royal Air Force Nursing Service.

The following Staff Nurses are promoted to the rank of Sister on the dates stated:—(Feb. 10) Miss P. H. Blackall, Miss B. M. Cadman, Miss E. J. Cassie, Miss K. H. Farrand, Miss G. M. I. Jenkins, Miss K. Thomas; (Feb. 14) Miss I. L. Hubbard.

Sister Miss D. M. Jones resigns her appointment (Feb. 29).

Royal Air Force Reserve

ROYAL AIR FORCE VOLUNTEER RESERVE.

Equipment Branch.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation on the dates stated:—(Jan. 6) E. J. W. S. Foote, C. W. J. A. Homan; (Jan. 15) E. C. Pointer, J. F. Keith; (Jan. 20) A. G. Jones; (Jan. 22) I. C. Swain; (Jan. 25) C. Heard-White, C. W. Rea; (Feb. 7) C. F. Burgess, H. W. A. Clifford, H. M. Heywood, D. H. Papps, J. D. Watford.

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—(Jan. 5) F. L. Mills, A. H. K. Stevens; (Jan. 12) C. W. Harman C. R. C. Marlow; (Jan. 26) J. F. H. Adams; (Feb. 2) W. P. Beddow, I. R. Mascall; (Feb. 9) A. E. Antill, J. L. King; (Feb. 16) C. W. S. Collins, R. B. Pavey; (Feb. 23) O. H. Downing, S. R. Fairhead, E. Howett, W. R. B. Phipps, R. W. Tyler; (Feb. 29) H. A. J. Bolwell, A. G. Dettmer.

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

W. H. Boven is granted a commission in Class CC as Flying Officer (June 12, 1939).

The following Flying Officers are transferred to the Administrative and Special Duties Branch on the dates stated:—(Jan. 27) A. W. Daly; (Feb. 26) A. I. A. McDougall; (Mar. 5) R. A. Kendrick.

The following officers are transferred from Class A to Class C on the dates stated:—Squadron Leaders: (Nov. 7, 1939) H. F. Jenkins, A.F.C.; (Sept. 28, 1939) G. L. G. Richmond. Flight Lieutenants:—(Oct. 24, 1939) S. H. Potter; (Jan. 11) L. S. Ash, F. J. Bailey. Flying Officers:—(Sept. 21, 1939) N. R. Harben, D.F.C.; (Dec. 9, 1939) F. D. Travers, D.F.C.

The following relinquish their commissions on cessation of duty on the dates stated:—Flight Lieutenants: (Dec. 2, 1939) C. M. Lister, M.C.; (Dec. 3, 1939) A. C. Clayton. Flying Officer: (Feb. 5) J. H. Fuller.

The notification in the *Gazette* of Oct. 20, 1939, concerning Flt. Lt. R. E. Barrett is cancelled.

Administrative and Special Duties Branch.

Flt. Lt. A. R. T. Pipon, D.S.C., resigns his commission (Feb. 22); F/O. B. P. Jones relinquishes his commission on account of ill-health (Feb. 20).

Erratum.

In the *Gazette* of Dec. 26, 1939, notification concerning Flt. Lt. C. E. Lugard, for Dec. 1, 1939, read Dec. 5, 1939.

Royal Air Force Volunteer Reserve

General Duties Branch.

Sgt. A. M. Taylor is granted a commission for five years as Pilot Officer on probation with effect from Dec. 1, 1939, and with seniority of March 29, 1939.

The following are granted commissions for the duration of hostilities in the ranks and on the dates stated:—Pilot Officers on probation: (Feb. 1) Sgt. D. E. C. Myland, Sgt. M. J. D. O'Leary. Acting Pilot Officer on probation:—(Feb. 14) Sgt. A. J. Picknett.

The following Wing Commanders relinquish their hon. commissions on cessation of duty on the dates stated:—(Oct. 15, 1939) J. L. C. White, M.C.; (Oct. 29, 1939) W. P. Mark-Wardlaw, D.S.O.

The notification in the *Gazette* of Nov. 14, 1939, concerning P/O. D. F. O. Shelford is cancelled.

Administrative and Special Duties Branch.

W. W. Parsons is granted a commission as Pilot Officer on probation (Aug. 29, 1939).

The following are granted commissions for the duration of hostilities as Pilot Officers on probation on the dates stated:—(Oct. 19, 1939) E. M. Hook; (Nov. 26, 1939) G. B. Atkinson; (Jan. 29) P. G. Boyd; (Feb. 8) A. G. Powell; (Feb. 9) H. Campbell, D.S.O., O.B.E., T.D., J. R. Wardrop; (Feb. 11) P. E. Lawrie; (Feb. 12) G. A. Chapman, J. J. St. L. Martin, M. J. O'Toole; (Feb. 14) T. P.W. Young; (Feb. 15) R. G. Brickell, A. A. W. Fowler, F. C. Honey, N. A. Lindley, J. Wells; (Feb. 16) H. Darby-Dowman, T. F. G. Strubell; (Feb. 17) T. Emmerson, V. E. A. Isherwood; (Feb. 18) J. L. Hall, H. A. Pound; (Feb. 19) G. C. Burnside, J. E. Carpenter, A. J. M. Collins, W. J. A. Osburn, G. W. Parker, C. De W. Taylor, W. J. Warner; (Feb. 20) G. E. M. Bennett, E. Cockburn, M.C., J. K. Dick-Cleland, G. D. Dick, F. Gwyther-Jones, D. E. Norman; (Feb. 22) W. A. Becker, E. M. Edlin, E. W. Husey, J. S. Walker; (Feb. 23) J. E. A. Binnie, W. G. Giles, H. E. R. Morris, G. W. Murray, C. Ralph, G. N. Sellers, D.F.C., T. H. Topping; (Feb. 24) C. E. St. J. Evers; (Feb. 25) R. Brockelbank.

A. R. Boyle, C.M.G., O.B.E., M.C., is granted an hon. commission as Air Commodore (Feb. 19); S. Byng-Maddick is granted an hon. commission as Flying Officer (Jan. 23). (Substituted for notification in the *Gazette* of Feb. 27); F/O. A. C. Smith is transferred to the General Duties Branch (March 11); P/O. on probation H. C. Redgrave resigns his commission (Feb. 8).

The notification in the *Gazette* of Oct. 20, 1939, concerning Flt. Lt. R. E. Barrett (R.A.F.O.) is cancelled.

ACTION: Pilots of a fighter squadron on the Western Front hurry to take off to intercept an enemy patrol.

Medical Branch.

The following are granted commissions for the duration of hostilities in the ranks and on the dates stated:—Flight Lieutenants: (Feb. 20) R. W. Nichol, M.R.C.S., L.R.C.P., M.R.C.O.G.; H. J. Ross, M.B., Ch.B., F.R.C.S.; Flying Officers: (Feb. 6) A. W. H. Oaker; (Feb. 20) W. Begg, M.B., Ch.B.; E. A. K. Hoppins, M.B., Ch.B.; N. McSharry, M.B., Ch.B.; C. A. C. O'Connor, M.B., B.Ch.

Dental Branch.

A. P. McClare, L.D.S., is granted a commission for the duration of hostilities as Flight Lieutenant (Feb. 23).

Chaplains Branch.

The following are granted commissions for the duration of hostilities with the relative rank of Squadron Leader on the dates stated:—(Feb. 16) The Rev. J. Aydon; (Feb. 20) The Rev. E. T. Killick; (Feb. 26) The Rev. R. U. Butler.

Errata.

In the *Gazette* of Dec. 19, 1939, notifications concerning W. E. Hole, R. S. Swanton, E. A. Waterton, A. C. Flavell, for Acting Pilot Officers on probation read Pilot Officers on probation. In the *Gazette* of Jan. 23, for 561531 Sgt. T. Allitt read 561440 Sgt. T. Allitt.

Auxiliary Air Force

General Duties Branch.

No. 903 (COUNTY OF LONDON) SQUADRON.—Acting Pilot Officer L. R. Fairbrother is confirmed in his appointment and graded as Pilot Officer (Sept. 3, 1939).

No. 934 (COUNTY OF DEVON) SQUADRON.—Acting Pilot Officer C. D. W. Harvey is confirmed in his appointment and graded as Pilot Officer (Sept. 3, 1939).

Administrative and Special Duties Branch.

No. 612 (COUNTY OF ABERDEEN) SQUADRON.—R. G. Warden is granted a commission as Pilot Officer on probation (March 12).

No. 613 (CITY OF MANCHESTER) SQUADRON.—Acting Pilot Officer R. Stone is confirmed in his appointment and graded as Pilot Officer (Nov. 15, 1939).

Accountant Branch.

No. 614 (COUNTY OF GLAMORGAN) SQUADRON.—Pilot Officer P. S. Potter is promoted to the rank of Flying Officer (Feb. 22).

Women's Auxiliary Air Force

The KING has been graciously pleased to approve of the appointment of Her Royal Highness, the Duchess of Gloucester, C.I., G.B.E., to be an Air Commandant, Women's Auxiliary Air Force.

The following are appointed Assistant Section Officers (March 2):—Cpl. Miss E. M. Ballard, Aircraftwoman 2nd Class Miss D. Betheder, Aircraftwoman 2nd Class Mrs. B. D. Boyd-Carpenter, Aircraftwoman 2nd Class Miss C. S. Ellis, Aircraftwoman 2nd Class Miss F. I. Freeman, Aircraftwoman 2nd Class Miss S. M. Frost, Cpl. Miss D. Garrod, Cpl. Mrs. M. Ives, Aircraftwoman 2nd Class Miss I. A. Jollye, Cpl. Miss W. B. Longford, Aircraftwoman 2nd Class Miss P. C. Pelly, Aircraftwoman 2nd Class Miss M. M. Robertson Durham, Aircraftwoman 2nd Class Miss M. L. A. Strickland, Cpl. Miss M. M. Walden Jones, Sgt. Mrs. H. Y. Widgery.

The following are appointed Assistant Section Officers on the dates stated:—(Feb. 26) Miss L. A. Wilson, Miss C. M. Wood; (March 2) Mrs. N. B. K. Cochran-Patrick.

COMMERCIAL NEWS from AUSTRALIA

£1,500,000 *for Civil Aviation*

THERE is good news about civil aviation in Australia —the Government have agreed to devote to its development during 1940 the sum of £1,500,000. This is a considerable sum for a country of 7,000,000 people, and is greater in proportion than the proposed subsidy of £4,000,000 per year which the internal and oversea services in this country got just a glimpse of before the war came and it was hastily repocketed. The £1,500,000 which Australia will spend is exclusive of that money to be paid to the civil aero clubs for the instruction they will do for the Empire Air Scheme.

Legislation has also been passed which gives the Director-General of Civil Aviation power to control the operation and expansion of the civil air services. Given the proper appreciation of the part which civil aviation can play in the development of a continent sixty times the size of England, the Director-General should be able to do much to bring in an era of orderly and efficient development of the air routes.

This decision shows a sound outlook and follows a period of "aeronautical thoughtfulness" on the part of the Menzies Government when they took over from the Lyons Cabinet. The incoming Menzies team did not know everything about the airline system of the Commonwealth and rightly said to the Civil Aviation Department, "We must think over this matter; award temporary contracts to the airline companies for six months ending December 31, 1939." Apparently the thinking has been to some purpose, and has no doubt been helped by the demonstration of usefulness in wartime which has been given by the civil airlines ever since Peace hid her face.

Machine Shortage

The transport aircraft in Australia must be getting rather depleted in these days with the four DC 3s of Australian National Airways taken by the Government as a squadron for the R.A.A.F and two all-metal craft involved in fires in the air, fortunately with no lives lost. Further information on the DC 2 *Bungana* accident, reported in our issue of February 22, makes it appear likely that a collision with a bird bent the airscrew and so caused it to vibrate so much that the petrol pipe broke. The subsequent fire weakened the tubes of the engine mount so much that the engine fell out. All of which shows that full-feathering airscrews are worth while—if anything does happen, the rotation of the engine can be stopped and the vibration which might lead to further more serious damage eliminated.

The temporary shortage of aircraft has been still further accentuated by the torrential rains to which Central Australia has been subject in January, causing numerous minor mishaps such as bogged aircraft and lost rescue 'planes. (Central Australia is remarkable for the fact that in many parts of it no rain will fall for years, and then will come a downpour that converts the Finke River, usually a dry river-bed, into a raging torrent a mile wide.) A Gipsy Moth was wrecked about 250 miles from Darwin when taking relief provisions to the Roper River police station, and an A. of A. Dragon was lost near Normanton, in the north of Queensland. Happily it was found later bogged on a cattle station.

On the trans-Tasman run, *Aotearoa* continues to go backwards and forwards between Australia and New Zealand, and had completed her eleventh return trip on February 8. This was done against a 40 m.p.h. head wind which extended from a low altitude up to at least 15,000ft. and the crossing took 11 hours. It is expected that an early start will be made to run a regular service across to New Zealand.

Pan-American Airways is reported to be seeking permission to run a four-day service once a fortnight from San Francisco via Honolulu and Noumea to Christchurch in New Zealand. A weekly service is intended later. Presumably it is lack of aircraft which has prevented Pan-American starting earlier on the trans-Pacific run.

Active Research

Work at the Aeronautical Division of the Council for Scientific and Industrial Research is going ahead actively. This division was set up after the visit of Dr. Wimperis to advise the Commonwealth on aeronautical research, and is under the charge of Mr. L. P. Coombes, formerly of Farnborough. A wind tunnel has been designed and a model constructed, and the contract for the construction of the tunnel has been let to a Melbourne firm for the sum of £9,098.

On the manufacturing side there was a rumour that the Government intended to take over Commonwealth Aircraft Corporation, which is a private arms-manufacturing concern with the capital largely held by the Broken Hill Proprietary Company, the steel monopoly of Australia. Other firms with capital invested are General Motors—Holden and Imperial Chemical Industries. Nothing further has, however, been heard of this rumour.

The Corporation has put out the first aircraft of its own design. It is a low-wing two-seater open cockpit trainer with a Gipsy Six engine. Of wooden construction, it will be a trainer of somewhat more lively characteristics than the Tiger Moth, and should be suitable for pilots who have mastered that aeroplane and are ready to pass to something else. Its top speed is said to be somewhere in the neighbourhood of 140 m.p.h.

The Aeronautical Inspection Directorate will be expanded, and is to be put entirely on a civilian footing. Applications have been called for these posts: Director of Aeronautical Inspection (salary £1,000 to £1,100 a year), Assistant Director (£750 to £852), Chief Inspectors (£636 to £708), Inspectors (£582 to £660), Assistant Inspectors, grade I (£510 to £546), grade II (£402 to £474), and Chief Examiners (£360 to £372).

Lightning

LIGHTNING discharges to aircraft in flight occur between two oppositely charged regions in cumulo-type clouds and are most likely to occur between 26 and 34 deg. F.—that is, near freezing point. This information is given in a paper on lightning in the Journal of the Aeronautical Sciences, by E. J. Minser, for December, 1939.

The paper advises the following flight procedure:—

1. Avoid, if possible, instrument flight through large cumulo-type clouds, especially at the level where the temperature is between 25 and 35 deg. F.
2. If, when on instruments, it is apparent from the temperature and degree of static and corona discharge that the aeroplane is in a highly charged zone, and a discharge is imminent, reduce speed and descend.
3. If a change in altitude is not possible and a reduction of speed does not materially reduce corona or static, keep eyes focused on the instrument panel, which should be brightly lighted at night. This will help to prevent temporary blindness if a discharge occurs near the cockpit.

Mail on "Hannibal"

THE Postmaster-General announces that air mail from India for this country was on board the air liner *Hannibal*, which left Karachi on March 1 and is now missing. It is not yet known whether any of the mail is likely to be recovered.

THE AUSTRALIAN EFFORT

14,300 *Pilots* : 16,000 *Other Ranks* : 27,000 *Ground Staff*

THE magnitude of Australia's part in the Empire Air Scheme is now being realised. Latest announcements state that within three years the Commonwealth will train 14,300 pilots and 16,000 other air personnel. In addition a ground staff of 27,000 will be needed to maintain the aircraft in use and provide all the necessary ground services. This totals up to about 57,000 men. As Australia's population is about 7,000,000, this means that nearly one per cent. of the total population of men, women and children of all ages will be engaged directly in the scheme Assuming that the ages of the men engaged lie between 18 and 38, a calculation shows that as many as one in twenty of this age group will be involved.

Four Regional Commands

Air Chief Marshal Sir Charles Burnett has been appointed Chief of the Air Staff and has already arrived out there. He has immediately made changes in the organisation and adopted the system of having four regional commands. The Air Board has been increased to five and Air Vice-Marshal Williams is member for organisation and equipment. A new post of Director-General of Production and Supply has been created and will be filled from outside the Air Force.

The Australian Government is at present planning and establishing the training centres, and it is reported from Australia that the first school will open in April. Recruiting is now starting and mobile units are being used to tour the country districts. The recruiting organisation, which is controlled from Sydney, expects to have to investigate up to the interview stage about 250,000 young men in 2½ years. This is on the assumption that about one in five will be found suitable. An intake rate of 1,000 recruits per month for duties in the air is aimed at. So far, of the 56,000 men who have offered themselves, 8,500 have volunteered for air crews, and 40 per cent. have been accepted.

As each recruit is accepted, he will be given a badge denoting membership of the Royal Australian Air Force Reserve, even though his training is not immediately started. The possession of the badge will make him ineligible for enlistment in any other branch of the forces.

The training of the ground staff for the maintenance work will call for enormous expansion in the technical education facilities of the Commonwealth. The technical schools of the capitals, which had already established classes for training ground engineers for civil aviation, will expand their activities to provide courses in addition for radio-operators, fitters and turners and tool-makers. The existing civil airline organisations, too, will aid in maintenance work by undertaking it under contract.

Men between 18 and 45 can enlist as fitters provided they have had several years' practical work in engineering workshops. If they can obtain a 60 per cent. pass in a trade test they will then undergo two months' specialised Air Force training before being allotted to maintenance work on airframes, engines or armament. The rates of pay during training will be £2 16s. per week for single men and £3 17s. for married men, with 7s. per week extra for each child under 16. In addition, of course, free messing, quarters, clothes and medical attention are provided.

Air Chief Marshal Sir Charles Burnett, Australian Chief of Air Staff, in consultation with Mr. Fairbairn, Australia's Air Minister.

Those who obtain a 40 per cent. pass will be allocated to training establishments in Melbourne, Sydney, Adelaide and Canberra for six months, after which they will be again tested. While under training they will receive 5s. per day, with extra allowances for married men, with, of course, the usual quarters and messing.

1,728 Aircraft

The aircraft for this huge scheme total 1,728. Primary and intermediate trainers will be manufactured in the Commonwealth. The de Havilland Aircraft Co. will make Moth Minors and Tiger Moths, and finished Minors and unfinished parts have already been shipped out from the English factory. Elementary trainers will number 486. The Wirraway intermediate trainers are now being turned out by Commonwealth Aircraft Corporation, and of these Australia will provide 82 and Great Britain 233. Advanced trainers will be supplied from Britain, the total being 336 Fairey Battles and 591 Avro Ansons.

In addition, but not for the scheme, America is supplying Lockheed Hudsons. During the expected duration of the scheme, some three years, Australia will spend about £A25,000,000 on the production and maintenance of aircraft. The industry will be controlled by an Aircraft Commission, with Mr. Harold Clapp as chairman. The Bristol Beauforts, which will be manufactured by contract and sub-contract from the Aircraft Commission, are for supply to Great Britain for combatant duties. It is likely that they will be powered by Pratt and Whitney Twin-Row Wasps, as the manufacture of these can be started more quickly than Bristol sleeve-valves.

Cargo Ships of the Air

CASE after case of pig bristles were unloaded from a K.L.M. aeroplane which landed in England from Holland the other day. The pig bristles came originally from Latvia and are to be used in England for the manufacture of hair brushes. This is only one instance of the many and varied cargoes transported from one end of the earth to the other in the K.L.M. cargo ships of the air. One "skytramp" arrived in England the other day carrying such oddly assorted things as silver fox furs, skins of all shapes and sizes, diamond dies, wireless parts, machinery, newspapers, oil samples, electron tubes and an oil painting.

The uses of the aerial tramp are many and varied. Before the war one carried three tons of ordinary house bricks from Holland to England. Aircraft have been converted into flying menageries when animals of all sorts ranging from performing fleas to 16 ft. pythons and fully grown lions have been carried in the same plane. And just before the war a "flying fish-pond" arrived at Croydon Airport. It was an airliner the whole floorspace of which had been converted into a big fish tank and filled with water to carry fish from the tropics. On another occasion the same idea was utilised, and as the skytramp cruised along two miles above the earth's surface, half a dozen baby crocodiles swam lazily round in the specially warmed water. Not even Jules Verne thought of that.

IT'S SAFER BY RAIL

"A. Viator" Hangs Up the Red Light : Making Air Transport Safer—for the Railways : What Will the G.P.O. Do About It? : Germany to run a Berlin-Amsterdam Service

HAVING poured a bucketful of grit into the works of civil aviation by the tyrannical suppression of some of the best organised and most useful of the internal air lines, the High Hats of the Air Ministry now begin to weep like anything to see such quantities of sand. Firms like North-Eastern Airways, Ltd., which by reason of their efficiency and progressive policy were a thorn in the side of the railway group of air services, are to be ruthlessly strangled and a virtual monopoly given to the railway bunch, who are doubtless asking for specifications at this minute for something with knobs on to fly slower than poor old lamented *Hannibal;* something perhaps with a non-retractable undercarriage, and instead a device to turn the wheels at right angles to the fuselage, thus attaining, when flown with flaps down, a maximum of 30 m.p.h. in still air.

When one of these, blown backwards into a tall tree when facing a 40 m.p.h. wind, fails to uphold the prestige of civil aviation, the railway companies may be expected to revive their well-known poster, "It's safer to travel by train," and to abolish all internal aviation in the interests of that travelling public they so tenderly nurture, especially on surburban lines, on the principle that it is better to be cosy, and that 25 in a compartment is company, but five aside is none.

Belated Enthusiasm

Having done all this, the Powers that Be suddenly start moaning after six months of complete neglect that nothing is nearer to their hearts than the promotion of British civil aviation. This is a sudden and violent awakening from six months of the profoundest slumber, and some important interests must have set the alarm clock ringing, because civil aviation has been very completely ignored by those who should have fought its battles ever since the war started.

But if you want a languid sniffer at the flowers in the garden to take a real interest in apiculture you must train a bellicose buck bee to sting him in the pants as he bends, and that's what seems to have happened in the case of civil aviculture. Fine words have been spoken about the future of civil aviation in the House of Commons. There is nothing in the history of those concerned with these matters which leads one to expect an aftermath of fine deeds.

Instead of lying down under the heel of the ubiquitous Brass Hat, the Big Noises of civil aviation, full fed on rich meats and blood-red wine, should have had sufficient ferocity to fight the Brass Hats on behalf of civil flying, the importance of which no Brass Hat can be expected to estimate, seeing that Brass Hats are only receptive of commercial ideas through the holes in their socks which their batmen keep religiously mended.

Tackling the Brass Hats

Civil aviation should have collared them low and hard at the start, with the sort of collar that brings an opponent down on his ear and drives his skull well and truly into the mud and makes him see all his past life flash by in a series of purple streaks and causes translucent tadpoles to dance before the eyes for a week afterwards. As it is, things have been altogether too lamb-like from the civil aviation side; what you might call "Sheep Shape and Bristol Fashion."

Meanwhile, others are getting a move on and I hear that our old and esteemed friends D.L.H. are to open a freight and mail service between Berlin and Amsterdam shortly, mainly, no doubt, to get German newspapers there as early as those which are now carried from London daily. That may lead to a D.L.H. service for passengers, or possibly a K.L.M. one between Amsterdam and Berlin, and next time you are in Holland do not accidentally step aboard the wrong plane and go "nach Berlin" even though Tempelhof may be a nicer airport than anything the authorities over here have provided for civil aviation.

Another line that has opened fairly recently is Stockholm, Riga, Moscow, thanks to the enterprise of A.B. Aerotransport, Sweden, who will operate in conjunction with Aeroflot, Russia. So a bloke can get about a bit, or could, if the Authorities would only let him have an exit permit. Travel should be encouraged, not stifled, and when the war has lasted a couple or three years longer it will be generally recognised.

Those Exit Permits

A case occurred the other day of a young business man liable to be called up for military service at some remote future date. He wanted to make a trip by air to a neutral country on his company's business; a trip of a couple or three days, not more. The business was important, but the Ministry of Economic Strangulation, or whoever attends to these things, would not grant him an exit permit. Why? If he returned in good order no harm would ensue, and if he fled to a neutral country and stayed there to avoid military service (which is absurd) no harm would be done either, because he would not be the type the Army needs and would not be worth his keep. The air line which would have sold him a ticket lost revenue and that is about the only clear and definite result of such Bumbledom.

Meanwhile the air lines are all running with pretty fair loads, and their importance is being pressed home by people of eminence who use them and find them quite indispensable. Ambassadors and their satellites use the air routes and then come home and point out how valuable air travel really is. Ambassadorial progress is not the real importance of the air lines, but it is liable to make little men in High Office bob and bow and smile delightedly and see visions of lovely decorations.

Slow Progress

So little by little we are wearing down the school which tried very hard to stifle civil aviation altogether at the beginning of the war. In the meantime we have some five services each way daily on Continental lines in and out of (careful!), whilst Newark in 1820 boasted that seven coaches passed through it daily to and from London. Which is just the sort of transport progress to delight the average Brass Hat.

Incidentally, I was amused to read the other day that when somebody suggested putting mails on stage coaches to expedite their delivery the scheme met with the instant and emphatic disapproval of the postal authorities. Cast your mind back to the early days of flying, and you'll remember that much the same attitude was adopted by the G.P.O. towards aeroplanes. But the G.P.O. certainly has rallied round commercial flying since those days; and indeed it is the Post Office, amongst others, which will ultimately defeat the military idea that civil flying is nothing more than a nuisance in wartime. A. VIATOR.

[Under the disguise of levity, "A Viator" calls attention to a state of affairs which is actually very serious indeed. So serious that the country will refuse to accept the Air Ministry's decision concerning the conduct of civil aviation during the war. An article on the full implications, by another contributor, will be found on pp. 260-261.—ED.]

HERE and THERE

Fighters for Scandinavia

IT is announced that the Vultee Co. has received an order for 144 Vanguards, its fast single-seater fighter powered with a Pratt and Whitney Twin-Row Wasp engine. Fifty extra engines have also been ordered and the contract figure is said to be $8,000,000 (about £1,600,000). It is also reported that the Norwegian Air Commission in the United States has purchased "more than 50" Curtiss P 36 pursuits.

Hannibal Search Abandoned

THE search for the Imperial Airways liner *Hannibal*, which was lost near Jask on the Iranian coast on March 1, has been abandoned. Previous reports, which stated that wreckage of the aeroplane had been found, were incorrect as the wreckage proved to be that of an old boat. No information on the cause of the accident is yet available. It must be presumed that the lives of the four passengers and four crew have been lost. The mail from India, Colombo and Goa has also been lost and that transferred at Jask from the preceding aeroplane.

British Overseas Airways Corporation

ANNOUNCEMENTS which have lately been made complete the appointments to the board of the British Overseas Airways Corporation. The board now consists of:

The Hon. Clive Pearson, chairman; Mr. Irvine Geddes, deputy chairman; Mr. W. L. Runciman, director-general (chief executive member); and Mr. Harold Brown and Mr. Gerard d'Erlanger.

The British Overseas Airways Act, 1939, says: "The Corporation shall consist of a chairman, deputy-chairman and such other number of members, not being less than nine nor more than fifteen, as the Secretary of State may from time to time think fit . . . ." but apparently action has been taken to change this.

Japanese Accident

THE wreckage of the Japanese airliner which has been missing since March 7 has been sighted on the side of Mount Nanasei in Formosa. Ground relief parties have left to give aid if possible to the six passengers and crew of two.

Trans-Tasman Air Service

THE Air Ministry announces that the Governments of the United Kingdom, Australia and New Zealand have agreed to the commencement of the Trans-Tasman air service in April with a frequency of one return flight each week. *Aotearoa* has already made several flights and the second flying boat for the service, *Awarua*, is expected in New Zealand in the very near future.

Pooled Services to Scandinavia

AS from March 1 the K.L.M. Royal Dutch Air Lines commenced to operate a new summer schedule. There will be no less than four services daily in each direction between London and Holland. These services are to be operated in pool by K.L.M., A.B.A. Swedish Air Lines and D.D.L. Danish Air Lines. The K.L.M., A.B.A. and D.D.L. will operate three services daily between England and Scandinavia via Holland bringing back the service to peacetime frequency. Chief among these services to Scandinavia is the combined K.L.M.-A.B.A. Scandinavian Air Express which will connect London with Stockholm, the Swedish Capital, in just over eight hours including stops at Amsterdam, Copenhagen and Malmö.

At Stockholm connections will be available for Finland by A.B.A. and Aero O/Y. Finnish Air Lines, and also for Moscow via Riga by A.B.A. and Aeroflot Russian Air Lines. This service is known as the Moscow Air Express. Twin-engined Douglas DC3 and four-engined Focke Wulf Condor airliners, seating 21 and 26 respectively, will be used exclusively on these routes. Light refreshments are served on all lines and a three-course luncheon on the Scandinavian Air Express.

PLOTTING THEIR LAST COURSE? Picture taken a short time ago in the map room at the headquarters of National Air Communications, which the Air Ministry has decided to dissolve.

EJECTOR EXHAUSTS

Some Aspects of Their Design and Construction

By J. A. T.

Fig. 1. Three-nozzle ejector exhaust.

ONE of the basic laws of thermodynamics states that heat and work are mutually convertible. Unfortunately, this conversion of energy can never be 100 per cent. efficient in practice, and actually the diesel engine, probably the most efficient form of heat engine, only attains a brake thermal efficiency of approximately 34 per cent. This latter figure is not an average value but has been reached, whilst modern aero engines rarely exceed 25 per cent. brake thermal efficiency. These low efficiencies are due chiefly to the fact that roughly 50 per cent. of the heat supplied in the form of fuel is lost in the cooling system, and another 25 per cent. passes out with the exhaust gases.

So far as the heat lost through the cooling system is concerned, part of this can be regained as thrust by the use of ducted radiators. A great deal of information has been collected about radiators in ducts, and mathematical proofs and practical tests have proved the advantages of such arrangements. Not only is the drag of the radiator reduced but its efficiency is raised, and, as stated, there is a propulsive effect due to the transference of heat to the air flowing through the duct.

In a further effort to regain in the form of thrust some of the heat lost from the engine, ejector exhausts have been developed to utilise the heat in the exhaust gases. Such exhausts are now being fitted to the majority of service aircraft, and in some cases the top speed has been increased by 10-12 m.p.h. At present it is possible to obtain an increase in horse-power of about 6½ per cent. of the maximum power available, but this can be improved by the careful design of exhaust systems and the use of the correct back pressure for the engine.

So far as the latter point is concerned, certain tests have been carried out to determine the efficiency of ejector exhausts working with various back pressures, but hitherto no engine has been designed with the optimum value required for efficient functioning of the engine and exhausts. However, as top speeds increase and aero engines become larger, the thrust available from the exhaust will take on added importance, and engine and engine installation design will need to be developed to cater for the new requirements. In estimating performance it is usual to add the increase in horse-power to that normally available at the airscrew shaft, having first made due allowance for airscrew efficiency. This method obviates one set of calculations and simplifies the work.

Types of Ejector Exhaust

Some of the earliest ejector exhausts had three or four nozzles, but the latest designs have only one. Fig. 1 shows a typical arrangement for a three-nozzle exhaust as fitted to a bank of six cylinders. Invariably the manifold or expansion chamber protrudes out into the slipstream, and although this is often due to the engine being tightly cowled and to the size of the manifold, it does mean that the exhaust is well cooled. The drag, however, is high, and efforts are generally made to "blister" the cowling so that some degree of fairing is obtained.

From the multiple-nozzle type of exhaust have been developed two other versions, both having only single nozzles: Fig. 2 shows a single-ejector exhaust, with the nozzle at the front end, and Fig. 3 the better-known type with its nozzle at the rear. The first of these two was developed particularly for use on engines fitted on the wings of an aircraft, where there might be trouble due to the hot exhaust gases impinging on the wing. By having the exit for the exhaust well forward, the gases are well cooled and dispersed before they reach the wing. However, both types are fundamentally the same so far as production and design are concerned, although a little more attention is required for the detail design of the forward nozzle type.

The advantage to be gained from fitting ejector exhausts has already been discussed, and so far as disadvantages are concerned there is only one main snag: that is, the dazzling or blinding of the pilot by the flames from the exhaust. This was to be expected, and is particularly bad during night flying. On aircraft intended for observation purposes, the exhaust must be emitted from a vent where it is least likely to upset the pilot or observer's view. This may mean fitting long extensions to the normal system, so that the gases can be carried down to the bottom of the engine nacelle from where they can be led out through a single nozzle.

On fighter or bomber aircraft, however, such refinements are not used, but the latest idea of using ducted exhausts reduces the size and brilliance of the exhaust flames whilst giving added thrust. Fig. 4 shows a typical arrangement for a ducted exhaust of the single-nozzle type.

Ducted Exhausts

Whilst it has been stated that the use of ducted exhausts reduces the dazzle to some extent, it should be pointed out that the real reason for fitting them is to reduce the temperature of the manifold and stub pipes, and thus to prevent burning. When it is remembered that the gases leave the cylinders with a temperature of between 900 and 1,000 degrees Centigrade, it will be appreciated that the question of burning is an important one; particularly as, for weight reasons, only thin-gauge metal is used. The present practice is to arrange for a cooling stream of air to enter the duct at the front end, from where it is directed along the manifold and stub pipes to the exit at the rear end, thus cooling the system and providing thrust due to the heat energy it has absorbed. It also provides a "cushion" of relatively cool air between the exhaust gases and the skin of the engine nacelle, thus again helping to prevent blistering and burning.

Ducts can, of course, be arranged for multiple-ejector exhausts, in which case the cooling air led in at the front

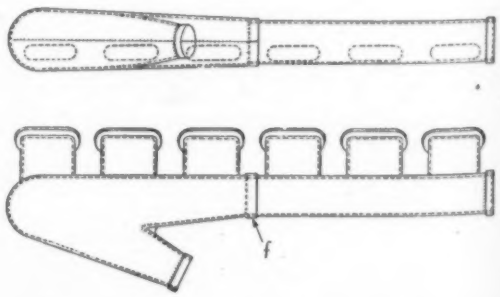


Fig. 2. "Saxophone" type of single ejector exhaust.

is guided along the manifold, and makes its exit at the various nozzles as shown in Fig. 5. When the forward-nozzle type of ejector exhaust is used—this version being known as the saxophone type—there are two methods of cooling which can be used. One is to use the same arrangement as shown in Fig. 4, the air coming in at the front end and leaving at the rear, but the better method is so to arrange the guides that the air flows from the entry to the rear end, where it is turned into the other half of the duct and flows back to the nozzle end of the exhaust, where it can make its exit.

The advantage of using the latter method is that the "extractor" effect of the nozzle assists in maintaining a steady and constant flow of cooling air through the duct, which is very necessary. A further point in favour of this method is that, as already mentioned, allowing the air to flow out around the nozzle reduces the temperature of the latter and of the exhaust gases.

Design and Production

The advantage to be gained from the use of ejector exhausts only becomes apparent when engines of 1,000 h.p. or more are being used in an aircraft. Thus the points now to be discussed are intended to apply particularly to ejector exhausts as fitted to engines of between 1,000 and 2,000 h.p.

Starting with the attachment the stub-pipe flanges are supplied by the firm which makes the engines and will be either for two or four studs. If they are drilled for two studs, they will be diamond-shaped, and the stub pipes will be circular; if they are meant to pick-up four studs on the cylinder head then they will be rectangular in shape, and likewise the stub pipes, in which case the latter will be made up in halves and welded together. See Fig. 6 (a). The stub-pipes which slide inside the flanges can be welded either on the inside or the outside, but generally the former method is used. Both methods are shown in Fig. 6 (b).

To simplify and cheapen production, efforts are generally made to keep all the stub pipes of the same length and shape, and when they have been welded to the manifold and the flanges welded in position, the latter are ground and tested on a surface table to make certain that they will bed down on the exhaust port faces, and that there will be no distortion or gas leakage. Inconel is used throughout the exhaust system, and the stub pipes are generally of 18 or 20 s.w.g. If they are of the rectangular type the two parts will be pressed up and welded along the centre-line as shown. It is not possible to give an exact figure for the cross-sectional area of the pipes, as this depends on the engine, but it would be approximately 5 sq. in.—it is, of course, determined by the flanges supplied.

The next important item is the manifold. Here again, cross-sectional areas depend upon the power being used, but it can be assumed that 30 sq. in. is adequate for a 1,000 h.p. motor, this area being the total maximum required at the nozzle end of the two exhausts. This figure applies to the rear-nozzle type of ejector exhaust in which the manifold is a tapering pipe, starting at the front end with a diameter of approximately 2.75in. and increasing to 4.5in. It should be noted from Fig. 3 that the inboard side of the manifold is straight, and only the outer and the top and bottom lines are tapering. The object of this arrangement is to keep the stub pipes of constant length.

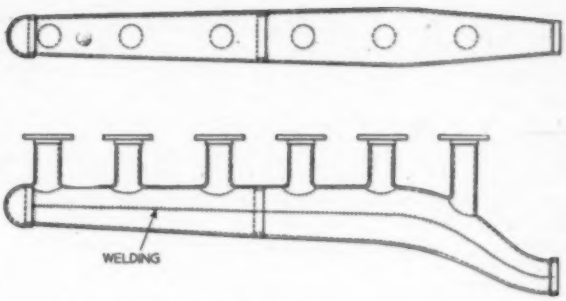


Fig. 3. Rear nozzle type of single ejector exhaust.

The length of the nozzle and its taper can only be determined by knowing the arrangement of the cowling and its structure. The exit area should be approximately 7 sq. in., or about half the maximum area of the manifold. It is essential that the taper of the nozzle should be gradual and made up of gentle curves, giving a good lead in from the manifold.

Smooth Flow

In view of the fact that the exhaust gases are flowing at high speed, and to avoid friction, turbulence, back-pressure, and hot spots, they must not in any way be impeded or their direction of flow altered in an abrupt manner. Hence there must be no sudden changes in cross-sectional area or rapid turns. To achieve a good flow is not always easy, and it is sometimes necessary to continue the "nozzle" back into the manifold, past the first stub pipe; this, of course, means that the latter must be a special one.

To gain the full advantage of an ejector exhaust it should be enclosed within the cowling, and in this case, as has already been stated, ducted cooling is used. Tight cowling, however, and the size of the manifold invariably means that it is impossible to enclose the latter, unless the cowling is "blistered" locally. Blisters are to be avoided wherever possible, and one method which has been tried is that of using an elliptical section for the manifold. There are two snags, however, which cannot be overcome; one is the fact that panting occurs, due to the comparatively large and only slightly curved sides. This soon results in fatigue of the metal and a cracking-up of welded joints. The other point is that, due to the narrow width, the flames from the stub pipes impinge on the opposite wall of the manifold and in a very short time burn through it. Thus elliptical manifolds, when used with their minor axis horizontal, have not proved very successful, although, of course, if it is desired to use them the other way about these objections, or at least the latter one, need not be considered. In any case, a circular section is easier to make and is more capable of withstanding pressure, although it should be remembered that it has less cooling area for a given cross-sectional area than an ellipse would have.

The construction of the manifold is simple; the rear-nozzle type is made up in halves and welded together. When the exhausts are for one aircraft only they are beaten to shape by hand. The metal beats well but is very hard, and the atomic hydrogen flame is sometimes used for the welding process, although oxy-acetylene is quite satisfactory. The position of the weld line depends upon the attitude of the manifold relative to the stub pipes, as, of course, it should be well clear of the latter (see Fig. 3).

Fig. 4. Single ejector ducted exhaust.

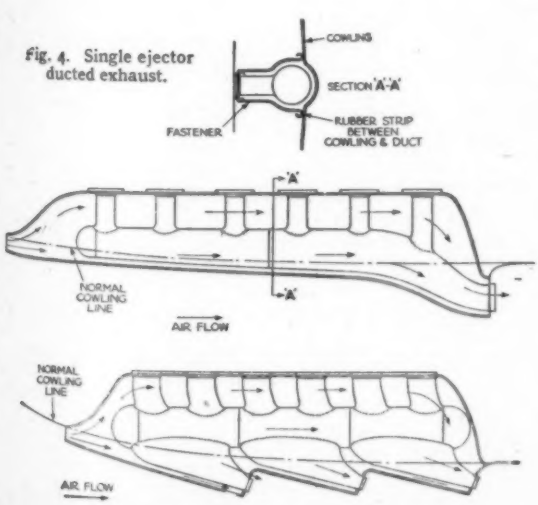


Fig. 5. Three-nozzle ducted exhaust.

In production the two parts are pressed out and a very good job can be produced.

One important point which must not be overlooked is the necessity of supplying expansion joints. Due to the high temperature and the length of the manifold, there is considerable expansion, and unless provision is made for this increase in length, severe stresses will be set up and may result in buckling and the failure of joints. It is normal to arrange for two or three expansion joints. These are positioned between stub pipes whose pitch is greater than the average.

It will be appreciated that on some engines the pitch of the exhaust stubs is not the same for all of them. Due to the disposition of certain components, some have a larger pitch than others. Where this is the case and the normal pitch is small, advantage is taken of the fact to make a joint, but if the pitch is constant, then the only consideration is that the manifold shall be divided equally, so that each portion has the same number of stub pipes leading into it.

The joints are made merely by arranging for the various sections to be telescoped together, the taper of the pipe being washed into a parallel portion of about 0.75in. long. This sliding fit must be made gas-tight, and sometimes, to ensure this, a strip of 18 or 20 s.w.g. Inconel is welded around the pipe as shown at (6c.)

Production Methods

Returning for a moment to production methods, the "saxophone" type of exhaust is generally made up of a parallel length of pipe—of probably 3in. diameter in the case of one cylinder block of 500 h.p.—and the front end, including the nozzle, is tapered and the required cross-sectional areas well faired together. Thus in this case there is only one expansion joint, and that is situated where the parallel and the tapered portions are joined (Fig. 2f. All manifolds are made up of 20 s.w.g. metal and the end opposite the nozzle is blanked off by a dished or domed end-piece.

In some cases the last stub pipe is curved so that it leads straight into the end of the manifold. To reinforce the tip of the nozzle, and to prevent burning, it is generally encircled with a strip of 16 or 18 s.w.g. Inconel, which is edge-welded into position. The assembly of the stub pipes to the manifold varies. When circular stub pipes are used, they are bell-mouthed and butt-welded to the manifold, which is cut away to the required shape. An alternative method, and one which is generally used in the case of rectangular stub pipes, is to arrange for the bell-mouth to be formed *inside* the manifold; the latter is then flanged out to form a collar around the pipe so that the two can be welded together. (See Fig. 6d.)

Both of these methods make good gas-tight joints, but, although the latter procedure takes longer and is more complicated, it has the advantage of making a stronger joint and one which is more capable of resisting the effects of vibration. In general, the manufacture of ejector exhausts is straightforward, but of the two kinds the "saxophone" type requires the more attention, due to the additional forming and welding of the "crutch" piece, although this is not a difficult task. The average weight of an ejector exhaust is 10½ lb. So much for plain single ejector exhausts.

Ducts

The reasons for using ducted exhausts have already been given, and it is only necessary to state the main points concerning their design and construction. In the first place, it is necessary to know the cowling arrangements and the position of the exhaust before any definite scheme can be laid down. In general, however, the walls of the duct should not be less than 0.4in. from the exhaust manifold or stub pipes. If they are, it will be impossible to obtain an adequate supply of cooling air in the duct; this will result in overheating and a burning of the walls. In any case, 20 or 22 s.w.g. Inconel should be used to form the duct. If the air gap is greater than 0.4, say, 0.75in., Alclad or Dural sheet can be used (the distance is optional, and depends upon the normal speed of the aircraft, the size of the air entry, and the space available in the engine nacelle).

The duct is formed as a trough or box, the top and bottom of which are joined by cowling fasteners to a strip of metal, which is welded into position along the stub-pipe flanges, and which is suitably flanged outboard to pick up the fasteners. This strip is of 20 s.w.g. Inconel. The outer edges of the top and bottom have a rubber strip or length of composite tubing riveted or "glued" to them. This latter "landing" not only prevents rattle and wear but also makes an airtight joint. The duct runs the full length of the exhaust, and at the front end it is well faired into the air entry. At the rear end, in the case of the rear-nozzle type of ejector, it leads out to the exit.

For the "saxophone" type the duct is similar, but is

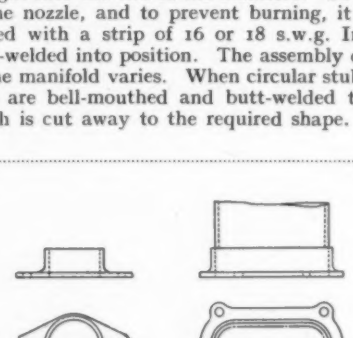


Fig. 6a. Two types of flanges.

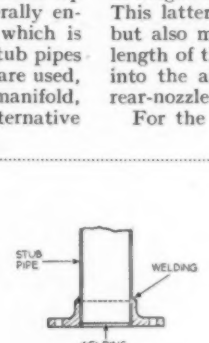


Fig. 6b. Two methods of welding stub pipes to flanges.

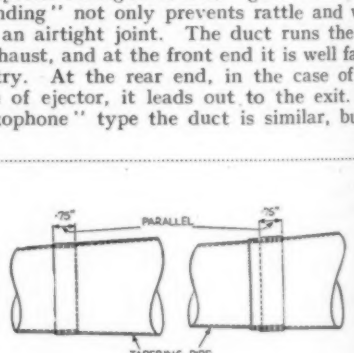


Fig. 6c. Two types of expansion joint.

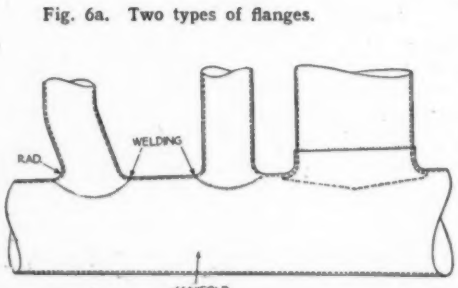


Fig. 6d. Stub pipe joints.

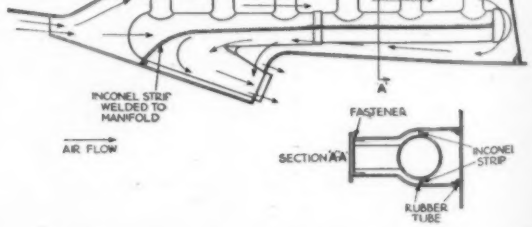


Fig. 6e. Arrangement of duct for "saxophone" ejector exhaust.

divided into two by a strip of Inconel welded down to the exhaust manifold. The purpose of this is to ensure that the air coming in at the front passes down the exhaust to the rear end, where it is turned and flows back to the exit at the front end. (See Fig. 6e.)

It is difficult to give areas for the entry and exit, as these depend upon the speed of the aircraft, their position on the cowling (upon which will depend the pressure head available) and the area of the jacket around the exhaust system. However, an area of 5 sq. in. should be adequate for the entry on a modern high-speed machine; and this could be increased to 6 or 7 for the exit. The right figures can only be obtained by experiment, since so much depends upon individual design, but one point that should be noted is that, to obviate entry losses, the duct must be well faired at the front end, and the shape of the orifice should be such that the air is slightly speeded up as it enters and before expanding into the duct proper.

It will, of course, be necessary to dish the cowling slightly to obtain a good entry. A good shape should also be given to the lip of the blistered portion. Sometimes the exhaust stands out rather far from the normal cowling lines, and this means that a good deal of press work is necessary on the panel. In such cases it is sometimes more convenient to cut the cowling away completely around the exhaust, and to arrange for a separate piece to fit over it and to be held in position by cowling fasteners. This latter method may make assembly easier, and means that press work, which is particularly difficult where the cowling surrounds the nozzle, has only to be carried out on a small sheet, the remainder of the cowling being quite straightforward.

Spinner Improvements

IMPROVEMENTS are announced in the design of Siebenthaler de-icing spinners for airscrews. These spinners can be used on both Hamilton and Curtiss airscrews and are available in diameters from 20 to 50 inches. Attachment is by the now well-known tubular rubber shear fittings which allow the spinner to vibrate should any ice form on it and disturb the balance. This vibration prevents the adherence of the ice, and as soon as it has been flung off the vibration ceases and does not recur until fresh ice has formed.

Appointments in the Maintenance Directorate

FOLLOWING upon the sudden death recently of Mr. Oliver Boden, Lord Nuffield has made a number of new appointments in the group of companies which he controls. Of particular interest to readers of *Flight* is the appointment of Mr. H. A. Ryder and Mr. H. Seaward to the posts of Deputy-Directors-General of Maintenance at the Air Ministry. Lord Nuffield, it will be remembered, is Director-General of Maintenance. Messrs. Ryder and Seaward are joint managing directors of Morris Motors, Ltd. Also of interest is Lord Nuffield's appointment of Mr. H. Clark to the post of Deputy-Controller of the Castle Bromwich aircraft factory of which Lord Nuffield is Controller.

Bristol's Lose an Old-timer

BY the death of Mr. John Hart Browning, who passed away on February 28, the Bristol Aeroplane Company lost one of the oldest and most valued of their employees. It was in 1913 that Mr. Browning first joined the "Bristol" Company as propeller manufacturing expert, and he continued to serve the Company's interests as head of this and the woodworking departments until the time of his death.

With Mr. Browning dies one of the old school of craftsmen whose pride was in his handiwork and to whom no job was too intricate and no effort too great to produce the finest ultimate result. This spirit was one with which he was able to infuse his staff, and the influence of Mr. Browning upon the high standard which has characterised the work emanating from the Bristol shops cannot be over-estimated.

G.A.P.A.N. Renewals of Certificates

WITH a view to the protection of instructors (pilots who at the outbreak of war held a current Guild Certificate and whose "A" or "B" licence had been endorsed for instruction), the Guild has decided to continue the renewal of certificates (which, with the issue of original certificates, has been suspended since the outbreak of war).

The requirements, which must be sent by post to the Guild of Air Pilots, 14, Thavies Inn, Holborn Circus, E.C.1, are set out below:—

(a) Instructor's Certificate.
(b) Five shillings.
(c) A certificate, signed by some person or employer who is in a position of authority in regard to the applicant, to the effect that the applicant has completed fifty hours' instructional flying in the last twelve months.
(d) Stamped addressed envelope.

It should be plain that this facility applies only to renewals and that applications for original certificates cannot be entertained. The requirements must be strictly complied with, since the Guild staff has been reduced to a minimum. It is an emergency measure simply designed to retain endorsement for the time being, and absolutely no complications or exceptional cases can be dealt with and no correspondence entered into.

Air Ministry Takes Over

THE commandeering of those aircraft which they require belonging to the independent air operators, that is, those not associated with railway finance, commenced on March 13, when a Ministry official inspected the various fleets at a certain airport. The independent operators claim that the compulsory acquirement of selected aircraft from their fleets, involving as it does the disbandment of their staffs, virtually eliminates them from the field of air transport but leaves that field open to airlines run by the big financial groups. The Air Transport Licensing Authority, a "court" to which the operators could have submitted their case, is no longer in existence, having been summarily "wiped out" by the Government soon after the outbreak of war.

Death of Capt. Sandwell

IT is with very deep regret that we have to announce the death, at Montreal, of Capt. A. H. Sandwell. Arnold Hugh Sandwell was on the editorial staff of *Flight* during the years preceding the Great War. He joined the Royal Naval Air Service and became a Flight Commander. Later he was absorbed into the R.A.F. After the war he went to Canada, where he was for many years at the head office of the Sun Life of Canada at Montreal. He did not altogether abandon his journalistic career, and for years he wrote regularly an aviation column in the "Montreal Star," in which he frequently paid tributes to his old paper *Flight*.

"Sandy," as we called him (he had curly red hair), was an extraordinarily lovable character. He never really grew up, and his enthusiasm was unbounded. Only about a month ago he wrote to the Editor and bemoaned the fact that he was not yet in uniform, but said he still had hopes. Now those hopes have been cut short, but we have the consolation that the end came suddenly. All the old members of our staff have lost a good friend and a colleague whose memory we shall always cherish.

FLIGHT **IDENTIFICATION CHARTS of BRITISH and GERMAN AIRCRAFT**

THOUSANDS of the wall cards issued by *Flight* enabling ready identification of military aircraft are in use throughout the country. The R.A.F., A.A. spotters and the Services generally, use them extensively. The British chart embodies 90 drawings with notes upon the leading characteristics of the types depicted. The chart of German aircraft includes 72 drawings of the main types from various angles. Incidentally, the drawings are copyright and may not be reproduced or re-copied without permission of the publishers in writing.

These copyright charts, measuring 22½in. by 14½in., may be obtained from the Flight Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1, price One Shilling, postage sixpence extra. Postage on six copies 7d.; postage on twelve copies, 10d.; postage on thirty-six copies, 1s.

"The Hawsidair Bros." Mr. F. S. Spriggs, Managing Director of the Hawker Siddeley Aircraft Co., Ltd., and Mr. H. K. Jones leaving the Armstrong Siddeley works at Coventry.

Vickers Dividend

AT a meeting of the Board of Vickers Limited, held on March 13, it was decided to recommend for approval at the annual general meeting to be held on April 3, 1940, a final dividend on the ordinary stock of 6 per cent. actual, less income tax, making 10 per cent. for the year ended December 31, 1939. Subject to such approval, payment will be made on April 4, 1940.

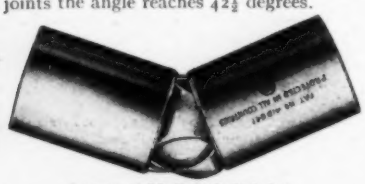
Net profit for the year, after providing for taxation, is £1,226,870, against £1,398,853 in 1938. The transfer to contingencies is £250,000 (£100,000 to contingencies and £350,000 to reserve in 1938) and the carry forward £480,188 (£321,760 in 1938).

Mollart Joints

IN a booklet under the title of "Universal Ball Joints," The Mollart Engineering Co., Ltd., have set out the sizes, purposes and instructions for fitting their patent ball joints.

These joints were designed in response to a demand for a joint of compact design yet capable of high duty and, at the same time giving reliable service.

It consists essentially of a ball grooved in two planes at right-angles to each other, this, in turn, being held by two forked members which encircle the ball by more than 180 deg. and slide in the ball grooves. The greatest care is exercised in manufacture so that a product of very high standard is obtained; the sliding and fitting surfaces are ground to tolerances of + or − 0.0005in. Normal Mollart joints will cater satisfactorily for angles up to 38 degrees, but in special joints the angle reaches 42½ degrees.



A typical Mollart ball joint.

Although these ball joints are their best-known product, they are by no means their only one. Mollarts turn out large quantities of exquisitely made jigs, tools and gauges for the Admiralty, Air Ministry and the aircraft and aero engine industry generally. Extreme precision boring is another speciality. The booklet contains all the necessary drawing office data for calculating the size of joint required for any particular purpose. Copies may be had from The Mollart Engineering Co., Ltd., Kingston By-pass, Surrey.

The Nickel Bulletin

AMONG the abstracts included in the latest issue of *The Nickel Bulletin*, extensive reference is made to recent work on the subject of the electrolytic polishing of metals. This process, which is supplementary to mechanical polishing, can be used with ferrous and non-ferrous materials and appears to have particular advantages for producing nickel-chromium corrosion-resisting steel sheets with a high lustre. Tabulated data on methods used with the more important base metals are included. Some important papers dealing with pyrometry are also abstracted.

The importance of nickel alloys in the problem of overcoming cylinder wear in automobile engines is indicated by another group of abstracts. These are of papers included in the collected researches on this subject published by the Institution of Automobile Engineers.

Present-day American practice regarding steel and cast iron gears is dealt with.

Copies of *The Nickel Bulletin* can be obtained by writing to The Mond Nickel Company, Ltd., Thames House, Millbank, S.W.1.

Lighting the Path

THE duties of a navigator in war are arduous and important. On his efforts, very largely, depend the safety of the machine and its crew, as well as the success or otherwise of their mission and, therefore, any help which may be rendered him becomes a real service.

THE INDUSTRY

During a flight it is necessary for the navigator to do a lot of map reading and make many intricate calculations. Since some of the night flights over Germany, Austria and Poland extend for nine hours or more, lighting of the chart table becomes of paramount importance.

The well-known Terry Angle-poise lamp seemed so suitable for this purpose that Herbert Terry, Ltd., have developed a model specially for use in aircraft.

For lightness sake it is made of duralumin and utilises the standard principles of Angle-poise spring-controlled swinging arms. In order that the lamp shall function effectively under all flying conditions, the joints are steadied by friction dampers which add to the automatic control and ensure the lamp remaining exactly where it is put, irrespective of the attitude or manœuvre of the aircraft.

Being a Terry product the quality is up to their usual high standard and it has been accepted by the Air Ministry as standard equipment on several types of aircraft.

Terry's latest Angle-poise lamp designed especially for use in aircraft.

NEW COMPANIES

OPPERMAN PRECISION ENGINEERS, LTD.—Private company. Registered March 9. Capital £3,500 in 3,500 shares of £1 each. Objects: To adopt an agreement with Carl T. Opperman for the acquisition of the business of a precision engineer, under the firm name of "C. T. Opperman"; and to carry on the business of precision, manufacturing, aeroplane and motor engineers, electricians, etc. The directors are: Oscar B. Davis, 245, Wiliesden Lane, N.W.2; Alexander Hunt, "Beechcroft," Hook Road, Surbiton, aeronautical engineer. Oscar B. Davis is permanent. Qualification: £100. Remuneration as fixed by the company. Secretary: Oscar B. Davis. Solicitors: Redpath, Marshall and Holdsworth, 23, Bush Lane, E.C.4. Registered office: Woodside Lane, North Finchley, N.12.

WRIGHTON AIRCRAFT, LTD.—Private company. Registered March 7. Capital £5,000 in 5,000 ordinary shares of £1 each. Objects: To carry on the business of designers, manufacturers and repairers of aeroplanes, parachutes, engines and other machines designed for aerial transit, and apparatus for and accessories appertaining thereto, etc. The subscribers (each with one share) are: Bernard R. J. Casbourne, 18, Highfield Crescent, Rayleigh, Essex, solicitor's clerk; Edward Cowland, 12, Seagrave Road, S.W.6, solicitor's clerk. The first directors are not named. Solicitors: Penselly and Co., 14, South Square, Gray's Inn, W.C.1. Registered office: Brampton Works, Billet Road, Walthamstow, E.17.